Vol. 2 MARCH, 1921 No. 12

THE PAPER INDUSTRY

The Monthly Educational Journal of the Paper Industry.

Weber Subterranean Pump Co.

50 East Forty-Second Street New York City

Air Operated

Weber Pumps

Installed

In Deep Wells

Increase

the Yield and

Decrease

the Power Cost

Silicate of Soda

WE ARE MANUFACTURERS OF

SPECIAL GRADES FOR LINING DIGESTERS
SPECIAL GRADES FOR USE IN THE BEATER AS A FILLER AND FINISHER
SPECIAL GRADES *for* ADHESIVE PURPOSES
SHIPMENTS IN TANK CARS OR DRUMS

MANUFACTURERS OF

PRIME REFINED SALT CAKE

(CALCINED SULPHATE OF SODA)

SULPHURIC ACID
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SODIUM SULPHIDE—*All varieties*

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NEW YORK

"M & W" Pumps
for Paper Mill Service

Stuff :: Suction :: Centrifugal

Our Pumps have made a reputation for themselves among the Paper Mills on account of ECONOMY, DEPENDABILITY and the LONG SATISFACTORY SERVICE they give AT THE LOWEST POSSIBLE UPKEEP EXPENSE

Booklets and Complete Information upon request

ONLY EXTREME OLD AGE CAN IMPAIR THE USEFULNESS OF MOORE & WHITE MACHINERY—AND THAT'S TO BE EXPECTED OF MAN, BEAST AND MACHINE

The Moore & White Company
ESTABLISHED 1886

North Philadelphia Station, P. R. R.

PHILADELPHIA, PENNSYLVANIA

Vol. 2—No. 12

THE PAPER INDUSTRY

A. SCOTT DOWD
Editor

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of the Pulp and Paper Industry

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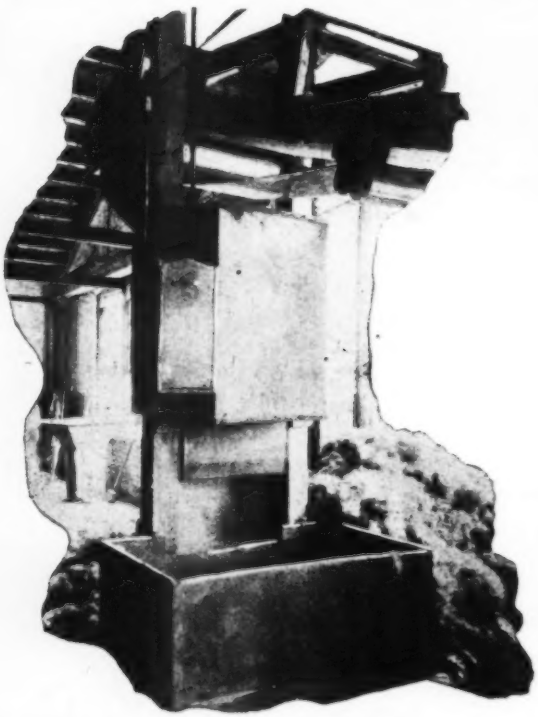
Dings Magnetic Separator



Magnetic Separators

Helping to Make a Better and Cleaner Sheet at the

John A. Manning Paper Co.'s Mill

There are many steps necessary in the manufacture of paper. Cutting the raw materials used is but one of them. Likewise keeping a keen edge on the cutting knives is but one of the many reasons for the initial removal of all scrap iron, staples, etc. from old magazines, books, etc.

The illustration shows one of three 12-in. x 24-in. Dings Magnetic Pulleys, in the Cutting and Dusting Department of this paper mill at Troy, New York. Each is making a clean separation on 2500 pounds of rope or bagging per hour. They have been in use 6 years.

Let our engineers show you what our pulley can do in your particular mill

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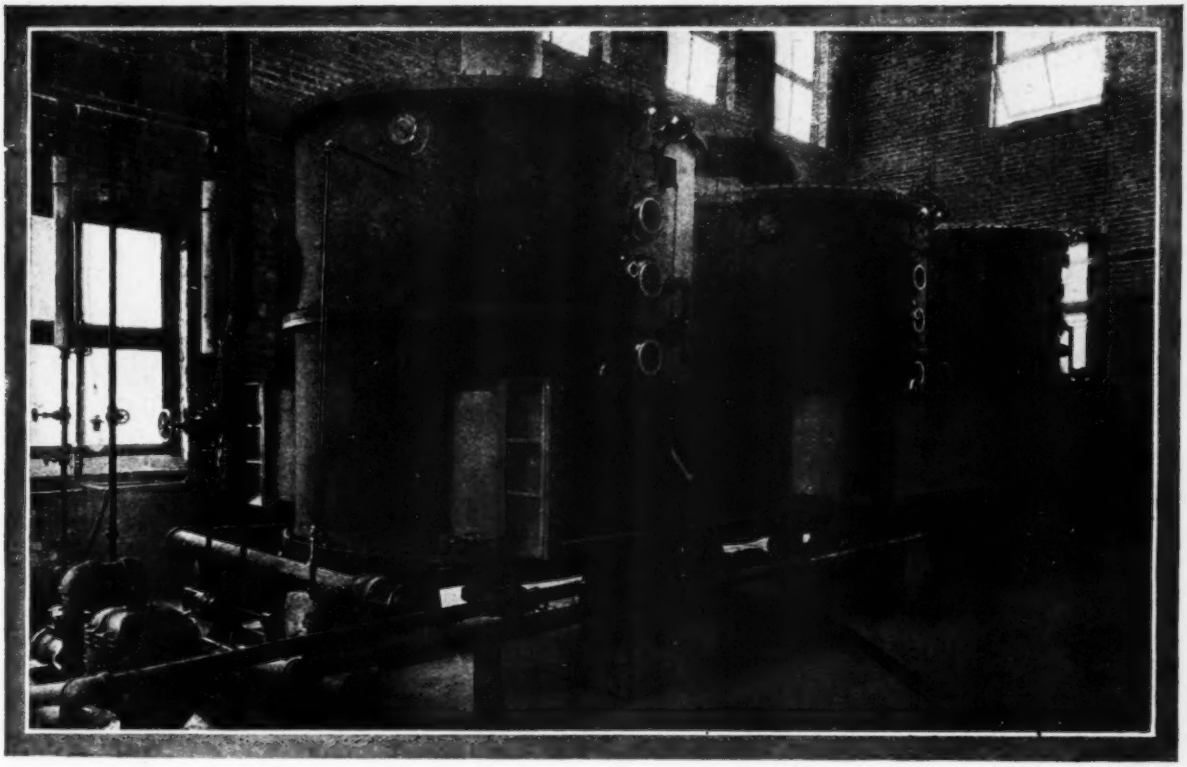

Is Your Evapora or Wearing Out?

If so, replace it with the highest development in pulp mill evaporators—Zaremba Evaporators.

Excessive loss of liquor, coupled with high cost of maintenance and repair make worn out evaporators "white elephants" that should be gotten rid of quickly.

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Water that is absolutely free from scale, sludge or mud forming impurities, can be delivered to your boilers at very low cost. Simply run your boiler feed water through a Permutit System—the mud, the hardness, all scale depositing impurities are instantaneously removed.

Permutit Water Softening Systems operate on a scientific principle, known as the Permutit Zeolite method. Without the addition of chemicals, without expert supervision, they accurately extract all the undesirable mineral impurities from any water supply, leaving it clean and soft.

Every piece of Permutit equipment is scientifically designed and honestly fabricated. It is built, not for profit alone, but for service—to solve manufacturing problems—and it's guarantees of performance are sustained by thousands of successful plants in daily operation throughout the country.

We will be pleased to work with you in solving your water problems.

This booklet contains valuable information that every steam boiler operator should have. Profusely illustrated. Sent free, postpaid, upon request.

The Permutit Company
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Filters *Softeners* *Special Apparatus*

A New Type of Safety Valve

THE Horkman Improved Valve is equipped with removable and renewable seat which may be taken out without removing valve from digester.

Carried in 8, 10 and 12 inch sizes

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Manufacturers of Bronze, Brass and Iron Castings

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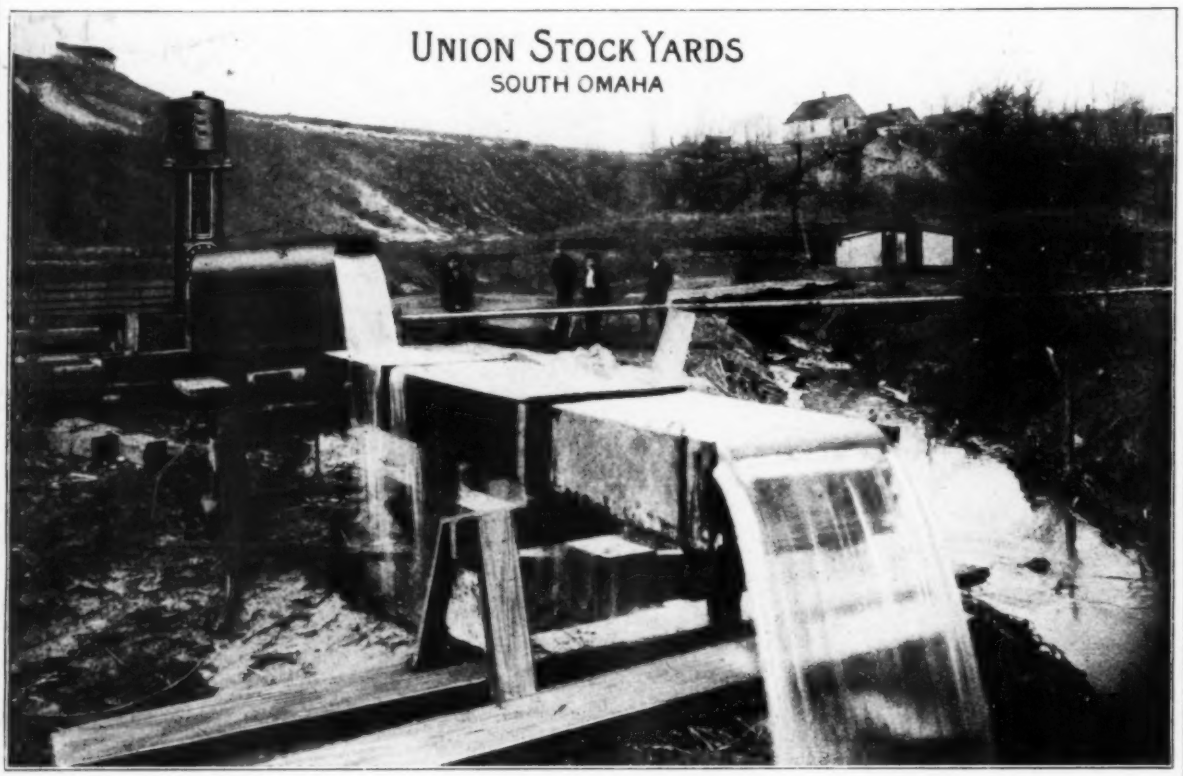
You will never be short of water at Your Paper Mill if you install Gregg Propeller Pumps in your deep wells.

We solved the water problem for the Union Stock Yards, South Omaha. We have solved the water problem for Several Paper Mills and other industries.



You do not need more wells. You need Gregg Propelled Pumps to develop your present wells to their full capacity and give you greater economy.

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GREGG SEWAGE AND SUMP PUMPS OF ANY CAPACITY
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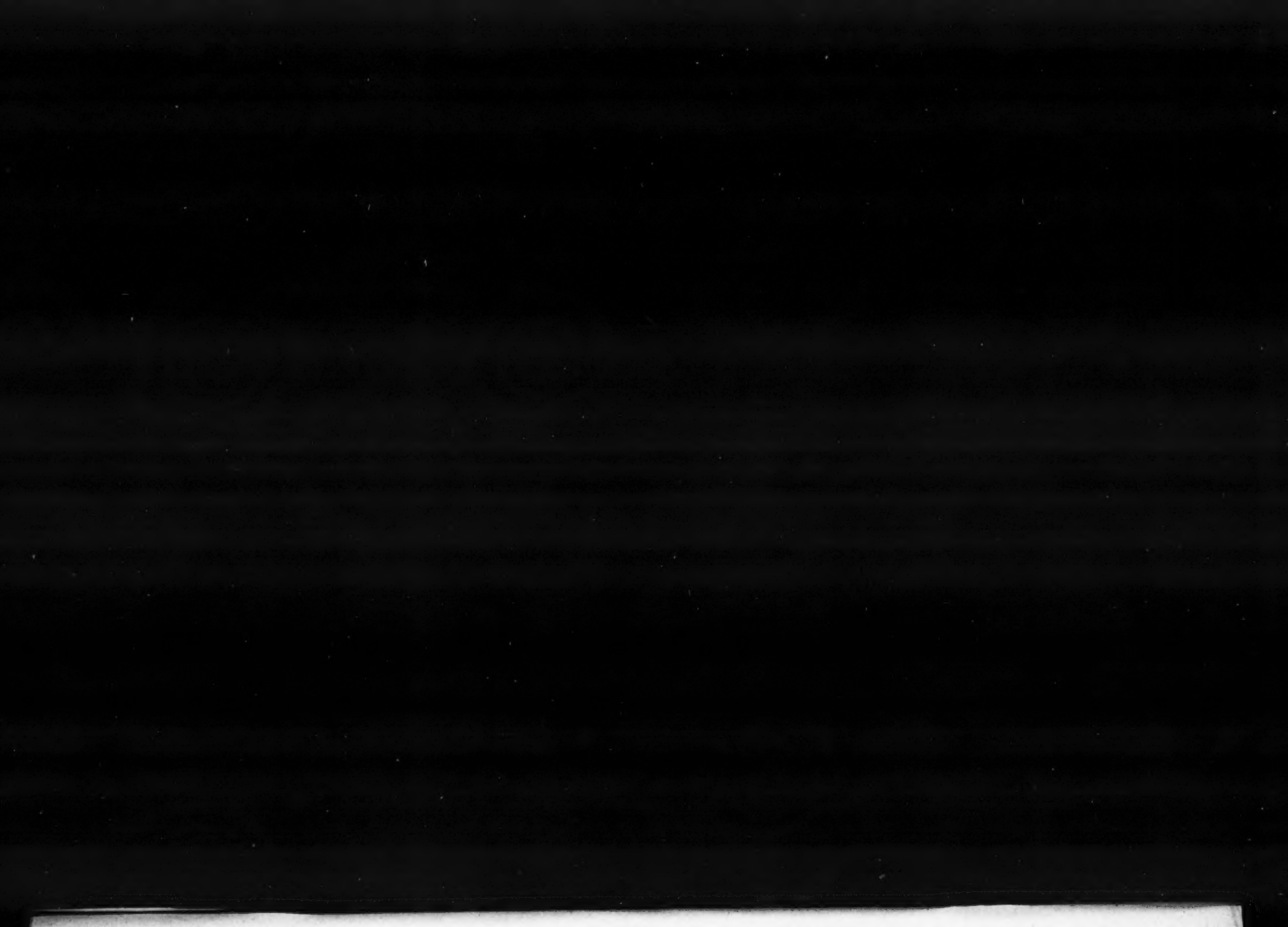
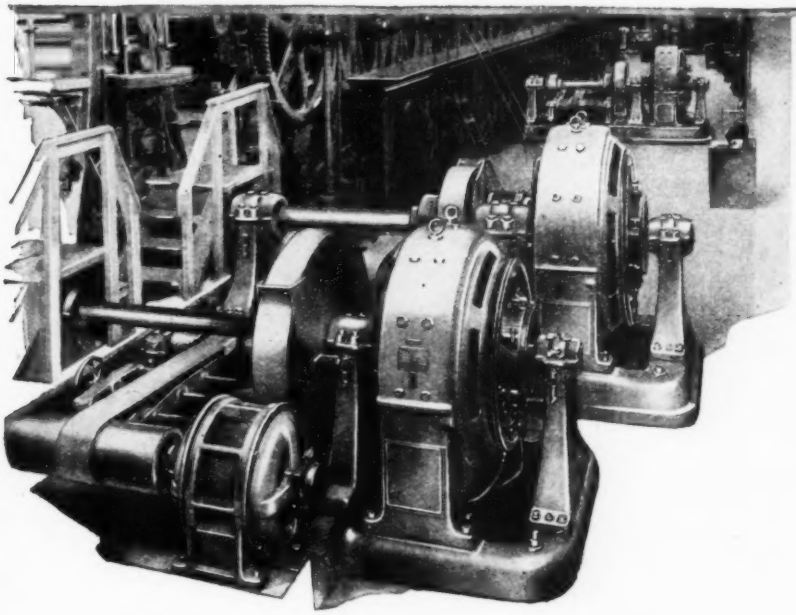


Shortage of paper is such a vital problem that no large producer or user of this commodity can afford to ignore its solution



Automatic compensator and master control for new sectional paper machine drive

Motor generator panel for paper machine drive

Better paper and more of it— through sectionalized drive

A GROWING demand for paper necessitates the absolute maximum production from every mill. To increase production, the speed of machines must be increased. At the same time this speed must be regulated and controlled if the paper is to be of uniform quality.

Paper machinery is big and expensive, and the process is delicate, from pulp to coating. Speed fluctuation is costly in "breaks," for each section of the entire machine performs a definite function and operates at a different speed. However, it is imperative that each one of these sectional speeds be uniform.

To meet such a complicated problem it became necessary for G-E engineers to devise a method of drive which would allow for a comparatively wide speed range for the entire paper making machine, as well as a speed range to operate each section of that machine as a unit, independently of the other sections. This was the only solution for "draw and stretch" difficulties.

The result is found in the G-E Sectionalized Drive, now in successful use in the West Linn, Oregon, mill of the Crown Willamette Paper Company. By applying a power unit to each section, consisting of a direct current motor and a synchronous motor driven by it, it is possible to perfectly control the speed of any single section or the whole machine. One generator supplies power for everything, while proper voltage regulation permits a wide range of speed.

As the load on any particular section is increased, the synchronous motor acts as a power plant and helps maintain an even speed. All the other synchronous motors then act simultaneously as generators, supplying current to the dead bus to which they are connected. As the load decreases, one synchronous motor acts as a generator, while each of the others absorbs its share of the current produced. Thus, load fluctuation does not affect the direct current motor, which goes on working at uniform speed.

In addition to the fact that G-E Sectionalized Drive allows a higher machine speed and a corresponding increase in paper production, it eliminates line shafting, belts, clutches and gears—saves valuable space, saves power, cuts down maintenance cost, and enables the operator to stop or reverse any section without disturbing the others.

Full particulars about this new method of drive are available at the nearest G-E District Office.

General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

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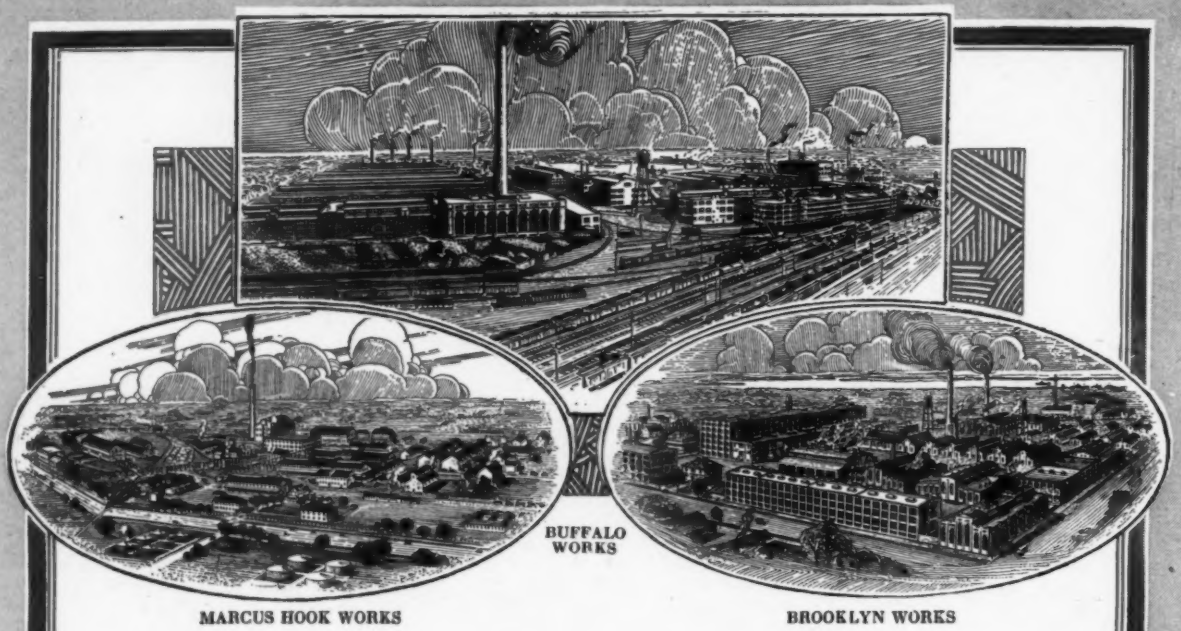


DYES FOR KRAFTSTOCK

THIS particular pulp, possessing properties which produce paper of well known quality, calls for dyes which will enable the paper maker to produce a wide variety of shades.

We are producing a line of dyes especially adapted for this work, including brown, orange, red, blue and green.

National Aniline and Chemical Co., Inc.

General Offices:
21 BURLING SLIP, NEW YORK

NATIONAL U.S.A. DYES

The Central States Forestry Conference

AN aggressive and far stepped advance has been made toward bringing to a successful issue a comprehensive and coordinated plan of state forest conservation and reforestation, in the organization of the Central States Forestry Conference, which had its birth at the conference on forestry matters, held at the Union League Club, Chicago, on February 24th, under the auspices of the club's forestry committee and public affairs committee. This new conference is to be composed of delegates from the eight participating states: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio and Wisconsin. Its permanent representation as set forth in the resolution, "shall include the state forester or other forestry official of each state and five delegates to be appointed by the governor; the permanent officers shall consist of a president, a vice-president from each state, a secretary, and an executive committeeman, and such additional officers as the permanent organization may find necessary."

The resolution, which was unanimously adopted, provided further that the representatives of the states who were present at the conference be "requested at once to appoint a committee of five to draft a statement covering **the need of action in forest conservation and forest reforestation,** and stating the plan of this conference with respect to the same, and to present to the governor of each state the request of the delegates to the Central States Conference herein proposed."

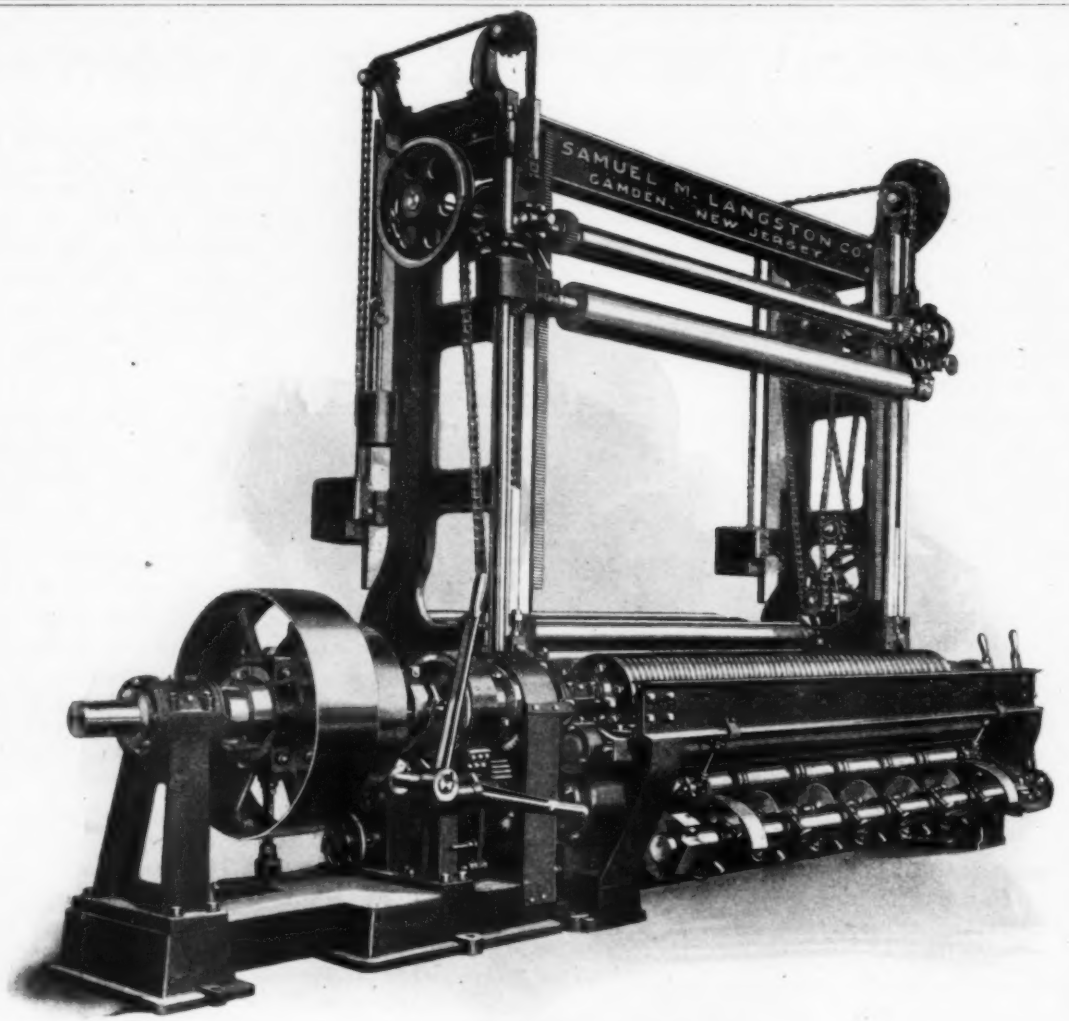
Many interesting possibilities present themselves in the study and consideration of this intended state forestry legislation. Two things most vitally involved are, protection from fire on private lands, and the taxation of privately owned timberlands; on these two issues, the states have all the say, and the national government no say, as far as actual power of legislative compulsion is concerned.

The state of Minnesota already has a forestry organization which has been characterized as "one of the most complex organizations created as a non-political enterprise." Mr. W. J. Cox, state forester, when asked to give an explanation of it, said that beginning in 1911, after the big fire at Baudette and Spooner, the state organized a forestry board, consisting of nine members. In order to take it out of politics as far as possible, provision was made that two of the members should be the dean of the Agricultural College of the University and the dean of the Forestry School; the other seven to be appointed by the governor on the recommendation of various other organizations, such as the Horticultural Society and the Agricultural Society. Mr. Cox said that the board, which was given charge of all the forestry work, fire protection, etc., and had the selecting of the state forester and the discharging of him if they saw fit, "has actually worked out very well."

Wisconsin has no constitutional authority yet to engage in forestry adequately, but a general set of principles which they intend sending on its way at this session of the legislature include a plan to plant trees along the shores of their 1,000 or more inland lakes and link the forestry up with fish and game, so that sportsmen's licenses can be so adjusted as to afford material revenues. It is believed that a fund of a half million dollars can be so raised and applied to conserving forests and their game inhabitants.

Success has been met in some states in the encouragement of forest planting by farmers, by giving them the material, and letting them plant the trees. This is particularly a good plan in places where the water level has dropped and interest is vital in getting the water back.

However, as Col. Greeley says, "the disease from which we are suffering is idle land. The success of any remedy that we may propose or carry out will be measured by acres of growing forests. It is not going to be measured by legislation or the organization of forestry agencies, but by acres of growing forests." Let us then hew to the line and get trees growing on some of the land by those who already own it.



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New Langston "D-A" Slitter and Winder

Hyatt Roller Bearings **S. K. F. Ball Bearings**

Balanced Drums—Hollow Slitter Shaft 7½" Diameter

KOEGEL CUTTERS

Stationary Racks Reduce Overhead Clearance

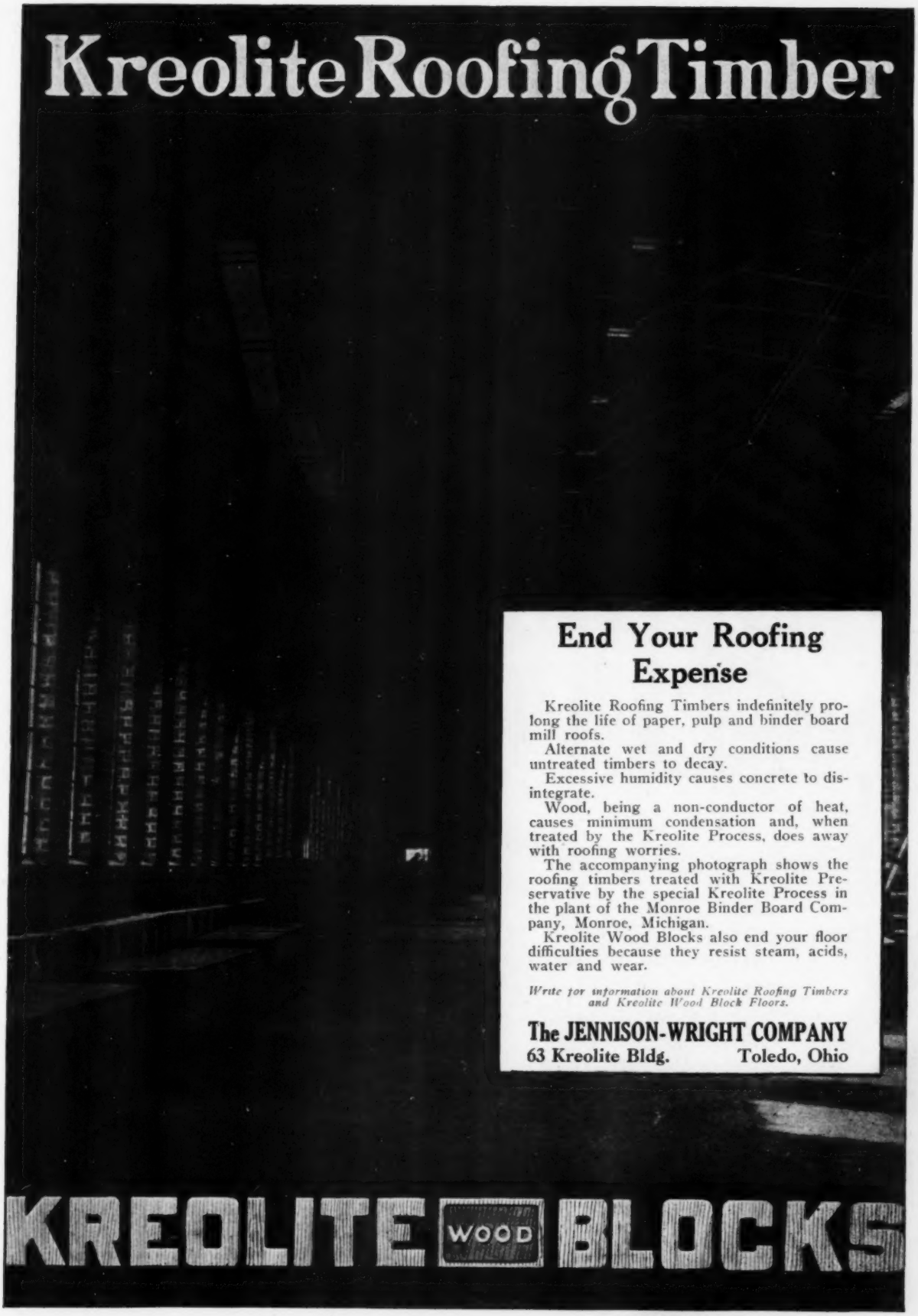
Separating Grooves and Special Spreaders Absolutely Prevent Interweaving

This machine is equipped with special separating grooves and spreading device patented January 22, 1907—November 28, 1911, March 7, 1916. The cutters are a combination of the Langston Interlocking Cutter, patented January 28, 1902, and a standard Koegel Cutter.

SAMUEL M. LANGSTON COMPANY

Camden, New Jersey

Kreolite Roofing Timber



End Your Roofing Expense

Kreolite Roofing Timbers indefinitely prolong the life of paper, pulp and binder board mill roofs.

Alternate wet and dry conditions cause untreated timbers to decay.

Excessive humidity causes concrete to disintegrate.

Wood, being a non-conductor of heat, causes minimum condensation and, when treated by the Kreolite Process, does away with roofing worries.

The accompanying photograph shows the roofing timbers treated with Kreolite Preservative by the special Kreolite Process in the plant of the Monroe Binder Board Company, Monroe, Michigan.

Kreolite Wood Blocks also end your floor difficulties because they resist steam, acids, water and wear.

Write for information about Kreolite Roofing Timbers and Kreolite Wood Block Floors.

The JENNISON-WRIGHT COMPANY
63 Kreolite Bldg. Toledo, Ohio

KNOW WHAT YOUR COAL BILL SHOULD BE

There's no longer any such commodity as "Cheap Coal," and indications are that there probably never will be again.

At present prices, or for that matter—at *any price*—it is neither good engineering practice nor good management to check your coal by mine weights or railroad weights.

RELIANCE WEIGHING MACHINES

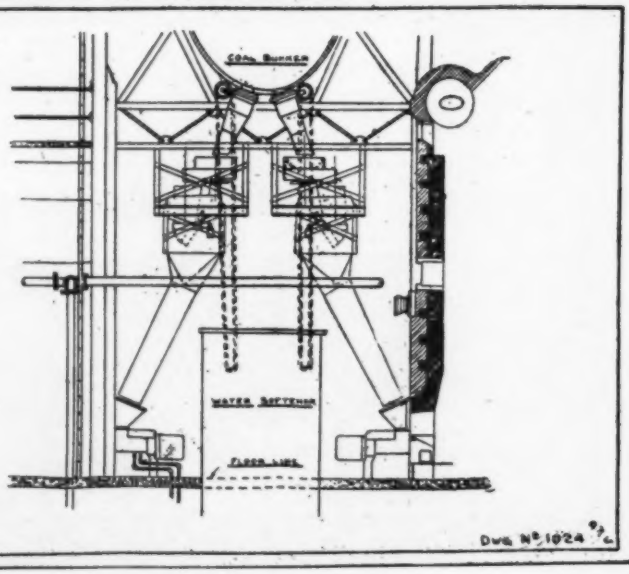
insure an *accurate* and *positive* check on every ounce of coal consumed. They provide a means, without additional labor cost, of checking the total received against the total purchased. They show to operator and executive which boiler is "hogging" the coal by giving the exact amount of coal consumed by each unit. They bring efficiency and economy into coal consumption.

Weighs—records—indicates—without manual effort—the entire operation automatic.

Each machine is a unit in itself, so perfect in design and flexible in application that it will meet any existing plant conditions.

The services of our engineers are at your command in helping you plan prospective installations.

Write now for details.



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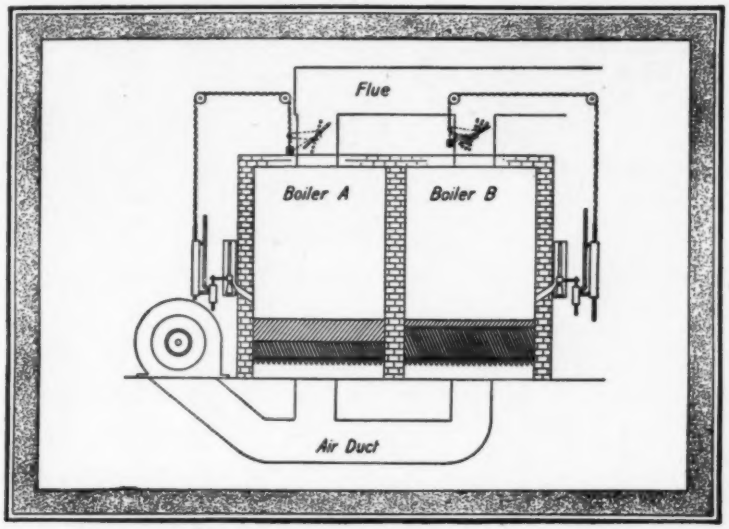
Representatives in principal cities United States and Canada

MODERN PRACTICE in COMBUSTION CONTROL

No. 3

Load Distribution by Individual Furnace Control



BALANCED Draft equalizes the load on the individual boilers by automatic individual control of the rate of fuel feed to each fire.

In the diagram above, we have assumed fire beds of unequal thickness in two boilers, A and B, the heavier shaded areas indicating this condition.

Because the thinner bed in Boiler A offers less resistance to the air duct pressure, the rate of combustion is higher than in Boiler B.

The Balanced Draft system utilizes the rate of fuel consumption as the source of control for fuel feed. Therefore, the faster consumption in Boiler A causes a faster rate of feed to that fire than to the fire under Boiler B.

When the fire bed in A reaches the thickness of that in B, the two are maintained level by a uniform rate of fuel feed. Fuel variations, etc., are immediately corrected by the same automatic process.

Where three or more boilers are on the same line, the action will be progressive. The thinnest fire will catch up with the next thin one; these two with the next, etc. Simultaneously, the too thick fires will be thinning down until ultimately all will be alike.

"Modern Practice in Combustion Control" gives a detailed description of the Balanced Draft System, how it functions, and the apparatus used. It tells of the remarkable savings in fuel and labor made possible by this correct system of control. Send for it today.

The Engineer Company

17 Battery Place **New York City**

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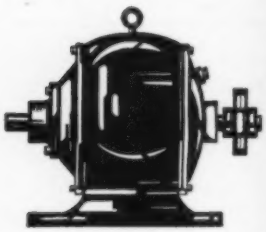
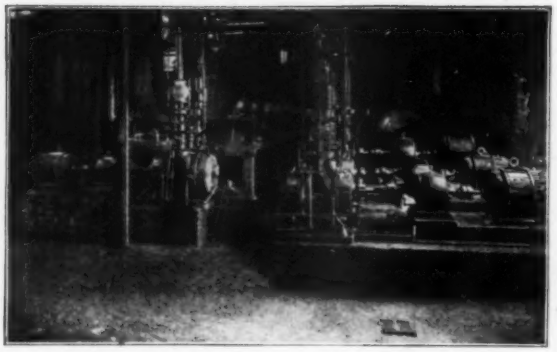
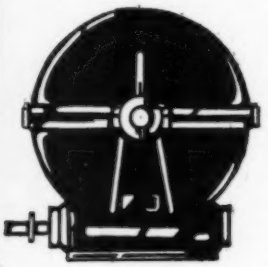
They stay gas tight and can be built *at any angle.*

Installed without disturbing the boiler they give the correctly tapered pass, eliminate dead spaces, increase heating surface and insure correct gas velocity.

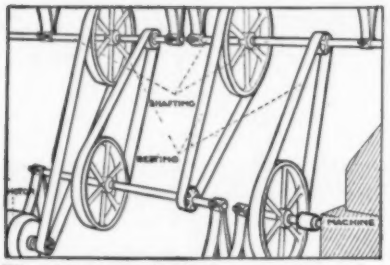
"The Development of An Idea" tells about them. Yours for the asking.



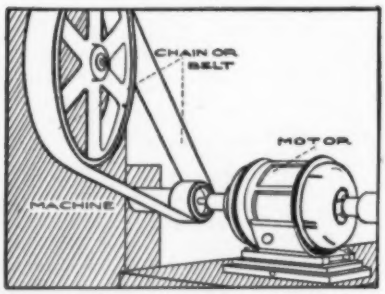




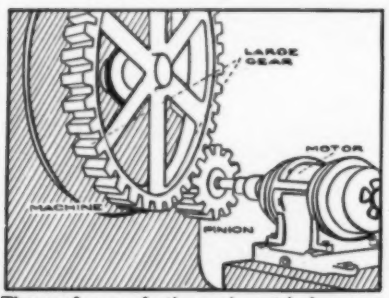
A battery of Foote Speed Transformers in use in the plant of the Republic Chemical Company, Pittsburgh, Pa.



Where belts are employed, slippage results, causing power loss, frequent replacement and repairs and when used with shafting utilize valuable space.



The use of a large and small gear to provide speed reduction causes friction, excessive wear and power oss, often resulting in production delays.



The use of open reduction equipment is dangerous to workers and costly to employers. Dust, dirt and grit cause undue wear on belts, chains, sprockets and open gears. And it is impossible to obtain as great reductions as with Foote Speed Transformers.

Foote Speed Transformers simplify motor speed reduction problems, save power, space, and replacement cost and provide positive safety for your workers.

Where a reduction greater than three to one is required, means of motor speed reduction such as the use of chains or belts driven direct from the motor or from shafting, large gears and pinion gears, are extremely wasteful.

Foote Speed Transformers are the recognized standard for reducing or increasing speeds of machinery without the use of line shafting and belts. They are made in types, sizes and speeds to meet any requirements.

Foote Engineers have indicated better methods, safer means, greater economies of motor speed reduction for many of the largest plants in America. Foote Engineers may be able to show you how you can greatly benefit through the use of Foote Speed Transformers. Writing for advice puts you under no obligation.

Foote Bros. Gear & Machine Co.

Cut Gears of All Kind Made to Order
Send for Catalog

250-260 N. Curtis St. Chicago, U.S.A.

FOOTE SPEED TRANSFORMERS

Business Trend Upward

"THE business depression ceased and business conditions turned permanently day before yesterday."

This statement greeted your representative as he entered the office of a leading paper merchant last Saturday.

"That's the best news I've heard for a long time," I said. "How do you figure it out?"

"Well," he said, "it's found in five words in the financial report of the day's operations last Thursday," and he ran his finger down the column of one of the big financial journals till it rested on these five significant words "Call money six per cent."

"Well," I said, "I understood you to say that the markets had turned permanently upwards and that the glooms of the past months had disappeared and we were about to enjoy some real business again." "Yes, I did say so, and I've given you the evidence that you asked for," and then he continued.

"The crux of the whole matter has been the liquid money situation. Last summer and last fall when we were running around in a vicious circle — wages advancing because commodities increased in price, and commodities increasing in price because wages were advancing—the banking system of the United States stepped through the circle, broke it and brought both ends against the middle by shutting down on speculation, refusing further credit accommodation to any speculative industries, stock market purchases or commercial expansions. While this was a very drastic procedure, yet it has been the healthiest and most salutary action. It has probably saved the nation from an unprecedented financial collapse."

"At the time the banks shut off further credit expansion, they also undertook to aid all legitimate business through the deflationary period that in consequence ensued. In proportion to the deflation in all lines of business, so far the failures have been phenomenally small, both as to numbers and liabilities involved, proving beyond cavil that the Federal Reserve Bank has done its work well. Call money in those days went as high as 12% and has ruled high ever since. Recently when liquidation in the large commodity lines, like textiles, steel, leather and foods, were generally accomplished, and loans and discounts within controllable size, and the opportunity for the employment of commercial funds without extra hazard at hand, call money came down to approximately a normal figure, proving that the high temperature of financial fever has passed. Funds from now on will be available to every reputable manufacturer who needs same for his business. The stock and grain markets will be supplied with funds at a reasonable basis for safe investment. This means the assurance of better times." "But," I said, "how soon will all this become apparent?"

"Oh!" he replied, "it won't be visible to the naked eye for a matter of ten weeks."

"Ten weeks," I exclaimed, "Why don't you know that with most of us it's a matter of ten minutes or ten days at the most. What are we going to do in the meantime?"

"Do," said he. "Do what you have been doing in the past four months. Hang on by your eyelids; keep kicking. They won't send the undertaker's wagon for you as long as you have got some life in you."

I looked at the calendar. Thursday, of which he was speaking, was March 17th, St. Patrick's day.

"Great snakes!" I said, "You are not running an Irish joke on me, are you?" "I never was so serious in anything before. I say to you solemnly that the bottom of the depression has been reached. It turned upwards on St. Patrick's day."

And he isn't Irish.

MUNISING PAPER COMPANY

MUNISING MICHIGAN

MANUFACTURERS OF

MUNISING M BOND

COLOR QUALITY AND UNIFORMITY
HAVE MADE FOR IT
AN ENVIABLE REPUTATION

Northern Paper Mills

"The Standard of Excellence"

"Northern" Toilet Papers

"Northern" Inter-Folded Towels

"Northern" Roll Towels

CAPACITY 100,000 LBS. PER DAY

NORTHERN PAPER MILLS, GREEN BAY, WIS.

Marathon Paper Mills Co.

Rothschild—Wisconsin

Paper Manufacturers

Carton and Paper Can Stock

Sulphite Bonds
Waxing Papers
Bleached-Specialties

Machine Glazed Plain and Watermarked Specialties

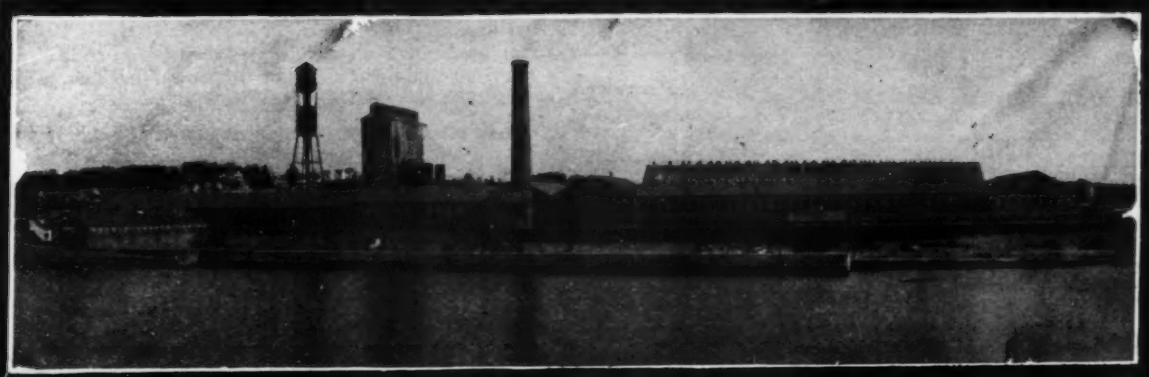
¶ One 100-inch Cylinder Machine, producing Solid Manilas, Single Lined and Double Lined Boards for Carton and Paper Can purposes.

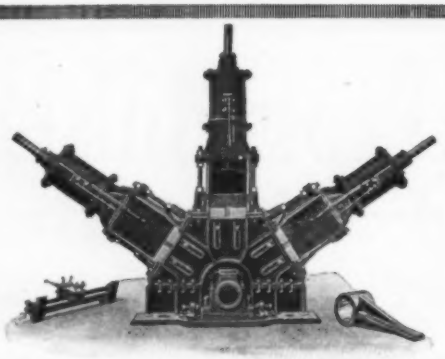
¶ One 120-inch Fourdrinier Machine, producing Sulphite Bond, and Bleached Papers for special conversions purposes.

¶ Two 120-inch Yankee Machines, producing Machine Glazed Papers in Plain and Special Stock Designs, as well as Special Watermarks.

Daily Production, 200,000 lbs.

SALES OFFICE
CONWAY BUILDING,
CHICAGO

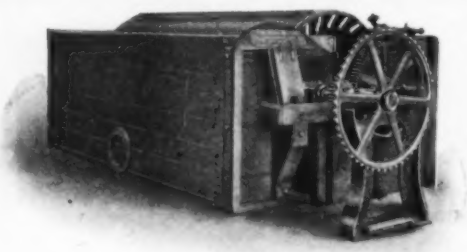




Standard Wood Pulp Grinder

Built in Three Sizes

Taking wood 24″, 30″ or 32″.
Bridge-trees—Are well proportioned.
Flanges—Made of steel, 40″ diameter.
Hydraulic Cylinders—Copper lined, 12″, 14″ or 16″ diameter.
Pillow Blocks—22″ length of bearing.
Pockets—Very heavy and designed particularly for free discharge of pulp.
Service—Continuous distinctive service is always assured.



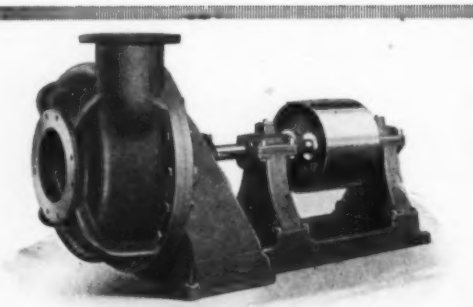
The Wood's Machine

Used as Pulp Thickeners, Savealls, Pulp Washers and Water Filters

ADVANTAGES:

Reduced Wire Costs	No Couch Roll
Enormous Capacity	Minimum Repairs
Only 2 H. P. Required	No Doctor
Works Automatically	Requires No Attention

TWENTY-NINE SOLD DURING THE PAST YEAR



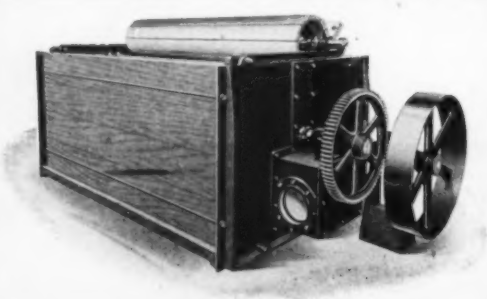
Heavy Duty Paper Mill Pumps

Built Especially for Handling Stock

Impeller—Extra wide, enclosed type and perfectly balanced against vibration and end thrust.

Suction Inlet—Is of large area, giving a free and easy entrance to same.

Our Pumps are economical in use, simple in construction, of very great durability and discharge continuous steady stream.



Improved Decker

Single or Double Cylinder Type

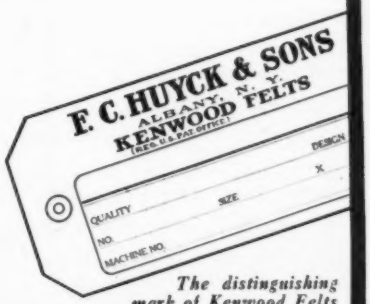
Built in the following sizes:
Cylinder mould diameter, 36″ or 40″.
Face of cylinder mould, 72″, 84″ or 96″.
Cylinder mould of best reinforced construction and properly supported with our latest design outside bearings.
Vat furnished either all wood or with cast iron ends.
For Stability and Efficiency our Improved Deckers are Unexcelled

PULP AND PAPER MILL MACHINERY
GLENS FALLS MACHINE WORKS
GLENS FALLS, NEW YORK

THIS new Kenwood extension, 90 by 400 feet and three floors high—108,000 square feet of extra floor space—assures our ability to meet the increasing demand for

Kenwood Felts
and
Kenwood Tan Jackets

The building is significant of our constant effort to maintain Kenwood uniformity and dependable service.



The distinguishing mark of Kenwood Felts

F. C. HUYCK & SONS
Albany, N. Y.
FELTS and JACKETS

A modern up-to-date plant +

Highest quality of material +

Long experience as paper machine wire makers +

A dissatisfaction with present attainments and constant effort to improve our product =

"APPLETON WIRES" which are Good Wires

APPLETON WIRE WORKS
APPLETON, WISCONSIN

An Army of Invasion

By R. L. S.

IF AN army of invasion should suddenly appear off the New England coast armed to the teeth and with an avowed determination to capture the national birthright of Uncle Sam, secure his riches, appropriate every point of advantage and carry off his gold, what would the citizens of the land do to protect themselves? If, instead of implements of war, still more subtle tools were used, so that the inhabitants of a peace loving nation, asleep to cupideous methods of foreign people, should imagine that nothing could harm them, while at the very moment a vast horde were quietly slipping into their very shoes, who should awake them to their danger?

There is an invasion going on in this country more subtle than any the history of the world records; an invasion so subtle that we fancy we are being benefited by the very influence that is attempting a theft of all that is highest and best in the land. We must awake to this envy and lust of nations if we are to be fit stewards of that with which Uncle Samuel has been intrusted. The subtle fawning which is today preying upon that which is fairest and best in this country is a very tangible though invisible foe, that, though not forcing our citizens back with arms of material strife, or poison gases with smoke screens of material factoring, is nevertheless utilizing a weapon, or leverage of materialism, more grossly material than any of these.

It would be entirely possible for a band of men, a nation given to cupidity, if they were tightly banded to do this nation greater damage than it has witnessed upon the European battlefields. All that would be necessary would be for them to have a mercenary motive, stick together, be willing and ready to grip points of commercial strategy, pool their resources in a common store of financial strength; then, link by link, the chain would be formed. Points of **quick money** would be the first to be captured; then would come necessity and appetite, always growing like a stealthy disease, creeping into the veins of commerce and filling the places of American men with an alien status that cares nothing for the ideals by which this land was endowed at its birth, but concerned only with a selfish, grasping clutch, cold, hard, yet so smooth as to deceive the very elect.

The world is in its seventh year of struggle with the old theory of competitive existence. We of these United States have an ideal far above our ability, as yet, to demonstrate. We can never go over the top in achieving the birthright left by the pilgrim fathers, and drag the scum of Europe as its only contribution to our welfare as a people. But the rascal thief is not always poorly clad; he often wears a saintly garb. Open your eyes, Mr. Everyman, when you go to the city and watch your steps to see where they lead you, and with what nationality you are dealing. You will come home after a single day of such watching a wiser man and a better citizen.

The hope of a Godly race
Lies in its boys and girls,
To keep untarnished the childish bud
As each tender petal unfurls.

But the tramp of lust is heard
In the halls and marts of trade,
Where the hunger wolf for gain,
Cares not how the game is played.

Memo:

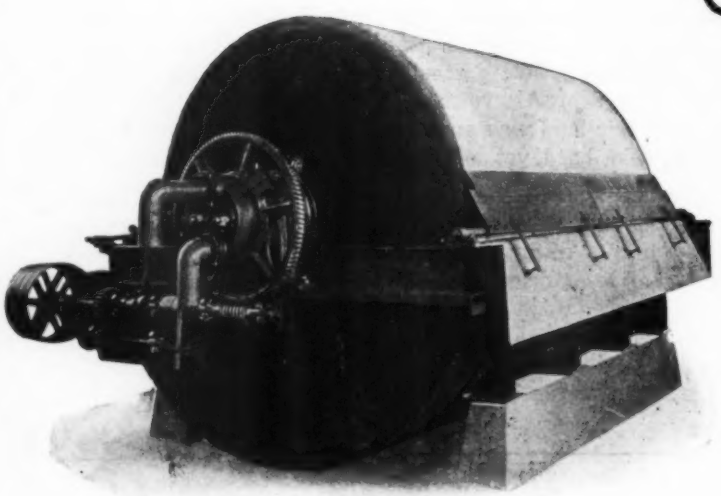
FOR PAPER MILLS

Down Went Causticizing-Plant Costs
AND
Up Came the Savings on Caustic

What Did It?

The Oliver Continuous Filter

But How?



We shall be glad to tell you just how such results were obtained, and in what way they may be similarly produced in your causticizing plant.

The engineering department of the Oliver Continuous Filter Co. is at your service for working out economies in your causticizing department in co-operation with your staff.

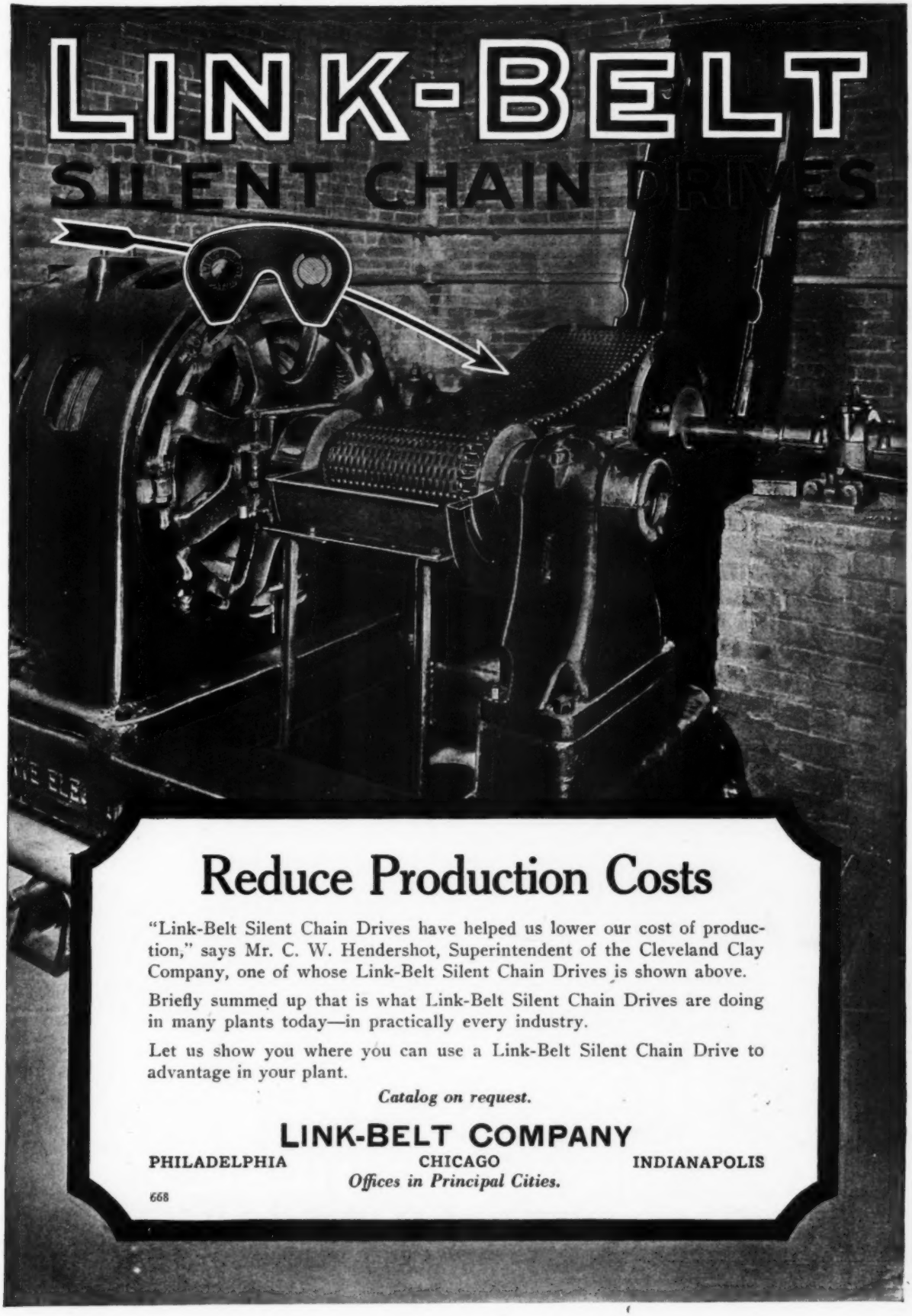
Write our nearest office for Bulletin 12-P, and for information regarding the latest developments in economies in causticizing-plant work.

OLIVER CONTINUOUS FILTER CO.

503 Market St.
San Francisco, Calif.

11 Southampton Row
London, W. C. 1

33 West 42nd St.
New York, N. Y.



Reduce Production Costs

"Link-Belt Silent Chain Drives have helped us lower our cost of production," says Mr. C. W. Hendershot, Superintendent of the Cleveland Clay Company, one of whose Link-Belt Silent Chain Drives is shown above.

Briefly summed up that is what Link-Belt Silent Chain Drives are doing in many plants today—in practically every industry.

Let us show you where you can use a Link-Belt Silent Chain Drive to advantage in your plant.

Catalog on request.

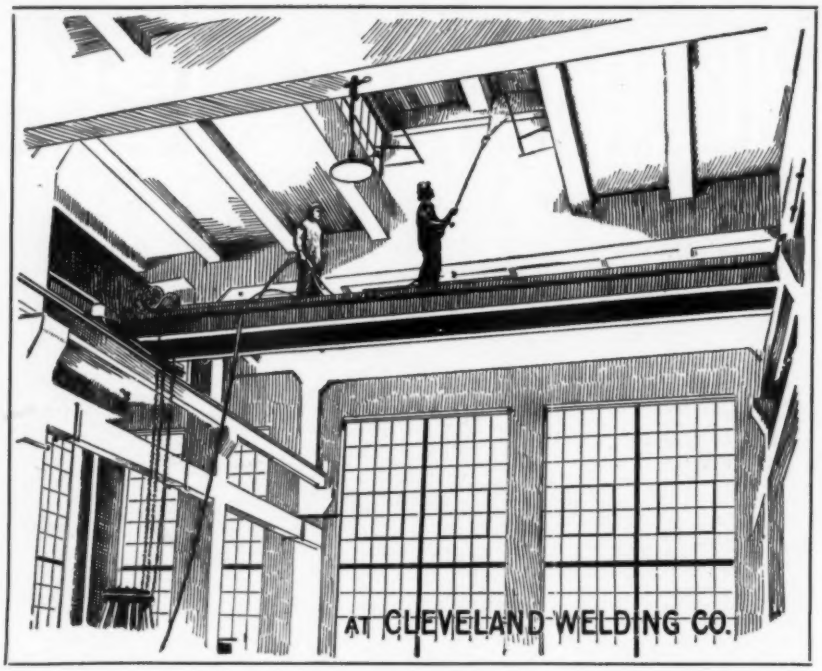
LINK-BELT COMPANY

PHILADELPHIA CHICAGO INDIANAPOLIS

Offices in Principal Cities.

668

Faster Better Less Costly Painting



THE reasons why Vortex Painting affords you a better, more rapid, more convenient painting job, at a saving of 30 to 50 percent of the cost, are clear when you realize the years of research that lie behind Vorcolite Paint and the Vortex painting mechanism.

Because an oil paint has been evolved that crystallizes in drying instead of oxidizing, it is possible to apply the same coating over metal, concrete, new wood, old paint—in fact, any surface normally encountered.

Because the Vortex Painter air-jackets its paint jet, it will apply paint four times as fast as is claimed for ordinary spraying devices, with less oxidation and scattering of the paint.

Because of the adjustable length of painting arm (3 to 12 feet) it is rarely necessary to erect scaffolding on a Vortex job. The illustration above shows how a 60-foot ceiling was painted from the crane.

Paint with your own labor, but with our paint and our equipment. Keep a Vortex equipment for your periodic needs. Our representative will call at your request and arrange a demonstration.

The VORTEX MANUFACTURING CO · CLEVELAND · O

"THINGS MOST IMPORTANT" WHEN BUILDING A POWER PLANT.

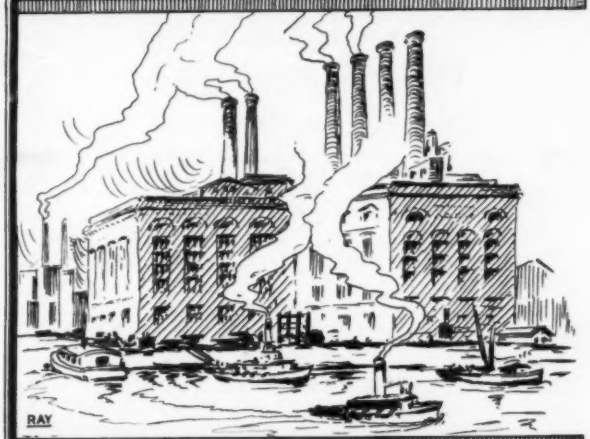
Your Piping

is one of the "Things Most Important" in the building of your Power plant.

A chain is no stronger than its weakest link, and your piping is the connecting link between your boiler and power generator.

Modern shop facilities and skilled workmen enable us to solve your power plant piping problems.

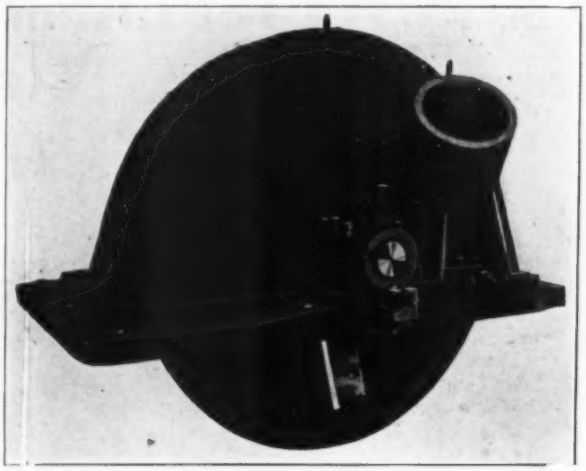
Welded headers, special welded work and pipe bends of every description.



Pittsburgh Piping and Equipment Co.
PITTSBURGH, PA.
NEW YORK, 220 BROADWAY. — CHICAGO, PEOPLES GAS BLDG. — CLEVELAND, AMERICAN TRUST BLDG.
INDIANAPOLIS, TRACTION TER. BLDG. — SAN FRANCISCO, MONADNOCK BLDG. — BIRMINGHAM, AMERICAN TRUST BLDG.

"WHEN YOU THINK OF PIPING, THINK OF PITTSBURGH PIPING."

Pulp and Paper Mill Machinery



Chippers

That produce clean, evenly cut chips, free from slivers.

Our patented improvements make this possible.

Made in
48", 84", 90" Sizes

Right or Left Hand
Three or Four Knives

Description on Request

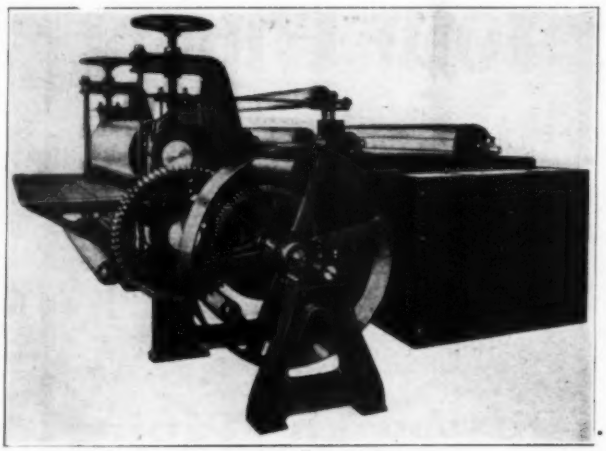
We manufacture
Wet Machines
that give satisfaction

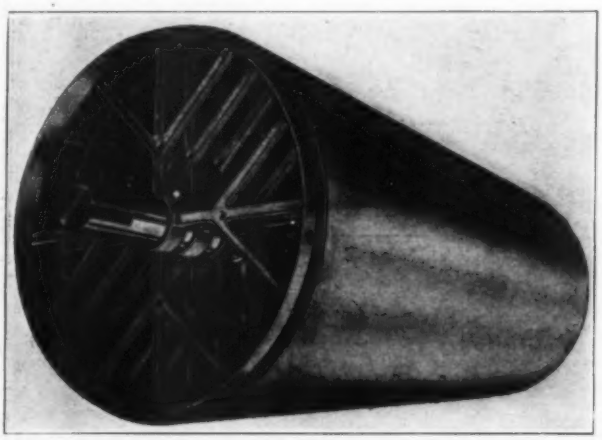
Single Cylinder
Double Cylinder

Any width face or diameter mould.

We also make a combination wet machine and decker.

Particulars on Request





Cylinder Moulds

Made on our special machinery—will stand long wear.

Hand sewed covers—Removable end Clamping Rings

Give a smooth surface, therefore a longer life to your felt.

Satisfaction Guaranteed

We also manufacture the "WOLF (Patented) MOULD."

We also manufacture 3 and 4 pocket Grinders, Screens, Barkers, Pumps, Iron, Brass, Bronze and Lead Castings

UNION IRON WORKS **Bangor, Maine**

$300.00 for an Article

Received Between October 1, 1920, and September 30, 1921

THE PAPER INDUSTRY was started with the one idea of being helpful to the whole Pulp and Paper Manufacturing Industry. We believe we have succeeded. At least many people tell us so, but we want to do more in being helpful, so that every man in the industry may know more of his chosen work.

Many men in this industry have valuable ideas that would be worth hundreds, possibly thousands of dollars, for other men to know, and at the same time will not harm the one man that knows it. The old idea of hiding our light under a bushel for fear someone else will learn of something that we may know has passed, and the war was to a large degree responsible for this. It is stated that America advanced more in most of the arts and sciences, as well as manufacturing processes, in the few years of the war period, than it had in fifty years before.

We lose nothing by giving out knowledge. If each of two men have a dollar and each gives his to the other, both will have the same and gain nothing, but if each of two men have an idea, and each gives away that which he has, he does not lose, but each has two, and so if we multiply this by one hundred or a thousand, each man that formerly had only one idea, now has a hundred or thousand, and no one has lost.

So, in order that the greatest number may have the greatest amount of knowledge, and in order to get men to take the time for the proper study and preparation of the right kind of an article, we will give to those who will endeavor to furnish us with real helpful articles, during the next twelve months, the following amounts:

For the best article furnished in this competition, we will give the sum of $300.00.
For the second best article we will pay $100.00.
For the third best article we will pay $50.00.
For the fourth best article we will pay $25.00.
For the fifth best article we will pay $15.00.
For the next thirty-one best articles, we will pay $10.00.
For the next forty best articles we will pay $5.00.

Any one man may write as many articles as he desires, providing they are on different subjects. Each article, however, should fill at least three pages of THE PAPER INDUSTRY.

Several well known men of the industry will be chosen as judges in this competition, their names to be announced at a later date, and the publisher of THE PAPER INDUSTRY will only decide first whether the article is worthy of publishing at all, and if so, then it will take its chance for the $300.00 prize.

In order to make it possible to publish these papers during the next twelve months, papers must begin to come in immediately and the minimum price of $5.00 will be paid for each as they are published, the balance representing the prize money will be awarded after the twelve months period has expired, and the decisions have been made.

Some men feel that they know many good things, but cannot write them down in proper fashion. It will not be necessary that these articles be written to show any great amount of learning, as many men who have had little schooling may be able to furnish the most helpful ideas, and it is something that is helpful that we want; we have an editor for the very purpose of carefully scrutinizing everything before it goes to the printer, so that it may be grammatically and typographically correct.

You can choose your own subject, as there are so many things to be written about in this great industry that we will not even attempt to outline the full list of subjects, but it may be of some plan to get a larger product out of a machine; it may be on the subject of saving in the power plant; saving bleach, dye, or one of many other things; it may be a plan to make the wire or felt last longer; some method of making a better sheet without increasing the cost, or making as good a sheet by reducing the cost; a new idea in the process of pulp making; in fact it can be on any subject that will be helpful to pulp and paper manufacturers, and their employes.

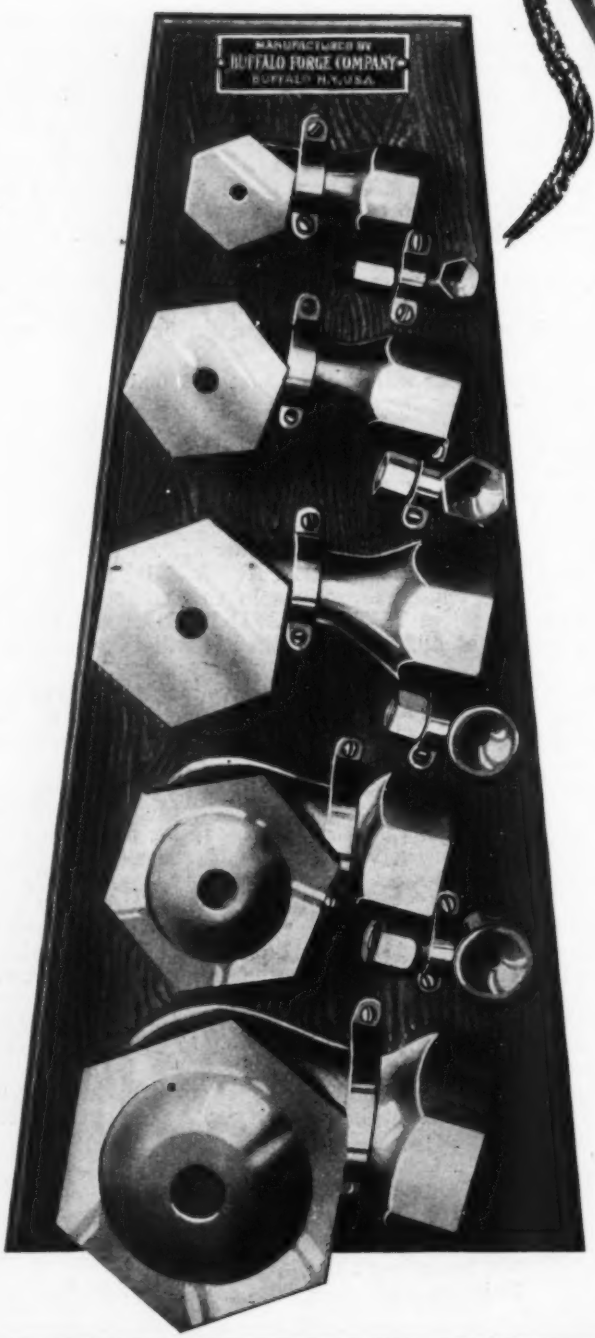
Anyone can try his hand, be he president, manager, superintendent, chemist, engineer, machinery man, foreman, or workman. If some one should feel they cannot write a long article, then write a short one. We will pay for it, if we can use it.

Start NOW and get your article or articles in at the earliest possible time.

Address all articles in this competition to

"Contest,"
THE PAPER INDUSTRY,
356 Monadnock Block,
Chicago, Ill.

Prevent Fires in Your Pulp Wood Piles



COSTLY fire losses in Pulp Wood piles can be prevented by keeping the piles under a spray of water.

Buffalo Patented Spray Nozzles produce a fine blanket of mist which effectively covers large areas. These Nozzles properly spaced will effectively take care of any condition.

Buffalo Nozzles are simple in construction consisting of only two parts; are inexpensive and have large orifices to prevent clogging. They produce fine sprays under low heads, requiring but two gallons a minute at 20 pounds pressure.

"Buffalo"

Write for Sample Nozzle

BUFFALO FORGE COMPANY

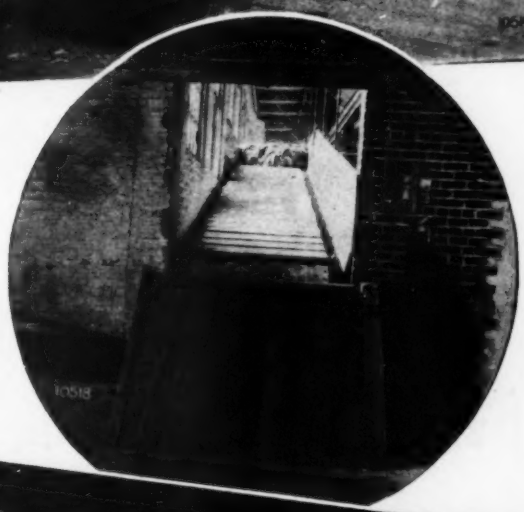
BUFFALO NEW YORK

Speed Up Production By
Handling Your Bales, Rolls, Bags, Boxes, etc.

With

Jeffrey

Apron Conveyers



THESE illustrations are typical examples of how Paper Mills and others in Allied Industries are lowering operating costs and increasing output by "Handling It Mechanically" with Jeffrey Standard Apron Conveyers.

For storage purposes a conveyer will not only do its work many times quicker than any other methods, but will store the same amount of material in a greatly reduced space.

Whatever your product, there is some place in your plant where Mechanical handling will be advantageous.

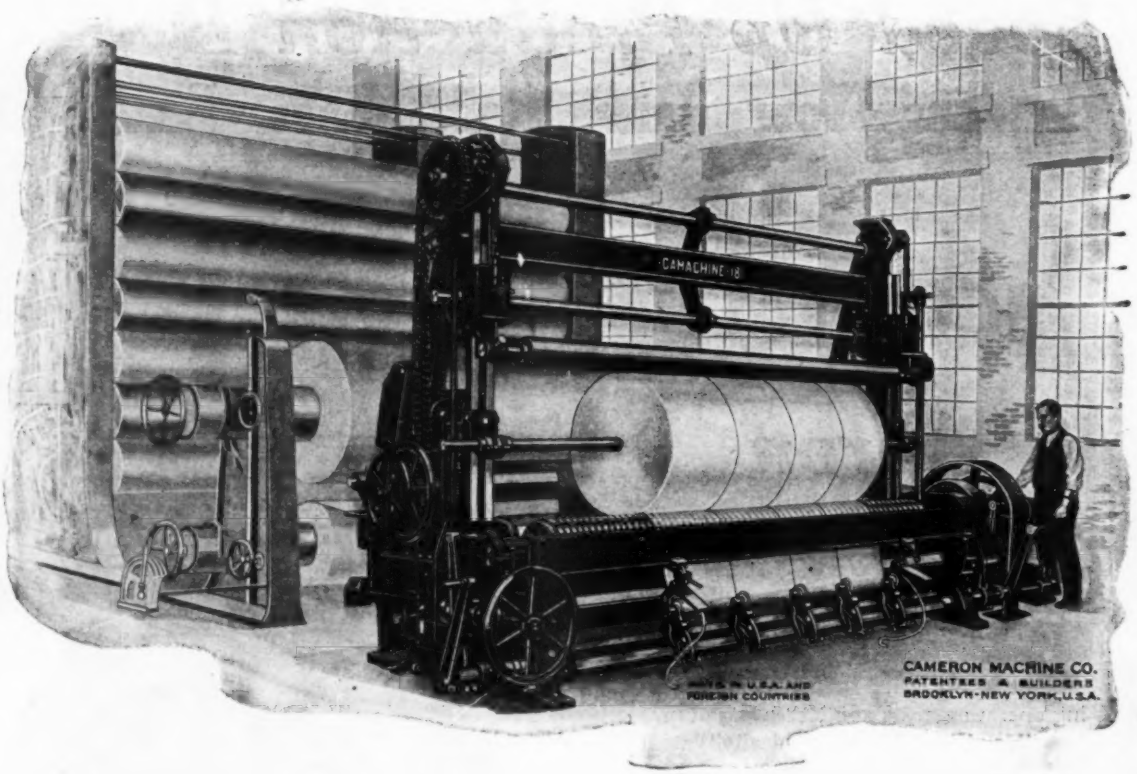
Investigate—and then write our experienced Engineers for advice and recommendations on the Right Type of Jeffrey Equipment to meet your requirements.

The Jeffrey Mfg. Co.

813 North Fourth Street, Columbus, Ohio

New York	Pittsburgh	St. Louis
Boston	Cleveland	Detroit
Philadelphia	Chicago	Birmingham
Scranton	Los Angeles	Buffalo
Charleston, W. Va.	Dallas	Montreal
Milwaukee	Denver	

Handle it Mechanically



CAMACHINE 18 Heavy Duty Mill Winder

2,000 Feet per Minute Speed of Web

can be maintained by **CAMACHINE-18** shown above. The machines are offered to the trade on the same terms as preceding models for twenty years past—**FREE TRIAL AND APPROVAL.**

CAMACHINE-18 has been developed with a view to handling the product of Paper-Making Machines direct from the reels.

Fast, accurate work, coupled with simple means for control and, above all, **DEPENDABILITY,** have been the ideals attained.

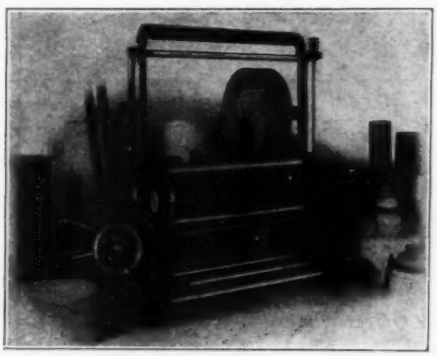
Important Notice Regarding Patent Rights

There are **no licencees** authorized to build this machine nor to use any of its patented principles or other patents issued or pending. Cameron Machine Company believes that it can serve the Paper Trade best by restricting solely to its own shop and specially trained staff, the manufacture of this machine, also the application of any patented features developed by its many years of experience devoted solely to Rewinder Problems.

CAMERON MACHINE CO., Brooklyn, N. Y.

Cameron Slitting and Rewinding Machines

For Paper Mill Finishing Rooms, Paper Converters and Wholesale Dealers



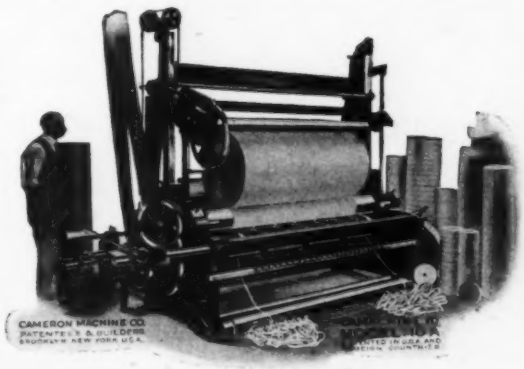
Camachine 6 Model 2A is built in widths from 32″ to 62″ for producing small Rolls down to "Midget" Rolls.

An Ideal Machine for Paper Specialties

The production of Rolls and Coils of all sizes and of all kinds of paper has been rendered **painless** by **Cameron Winders.**

Camachine 10 Model 10A is built in widths from 42″ to 82″ for producing medium sized rolls up to a maximum diameter of 36″. An all around machine for general utility.

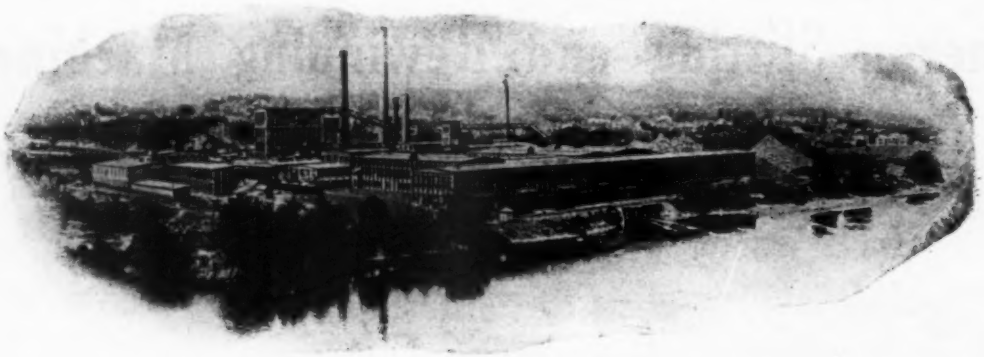
Cameron Machines Have Always Been Offered to the Trade on the Basis of FREE TRIAL and APPROVAL



CAMERON MACHINE COMPANY

Patentees and Builders

Brooklyn, New York, U. S. A.



Oxford Paper Company

Mills at
RUMFORD
MAINE

Executive Offices
200 Fifth Avenue
NEW YORK

Manufacturers of

High Grade Machine Finish and Super-Calendered Book Papers

CAPACITY OF MILL, 300 TONS OF PAPER PER DAY

Nashwaak Pulp & Paper Co. Limited

Manufacturers of

P

Canadian Bleached Sulphite

Mills: St. John, N. B., Canada

GENERAL SALES OFFICE
200 Fifth Avenue NEW YORK

Maine Coated Paper Co.

Manufacturers of

Polar, Hi-Tone and North Star Coated Book Papers

ALSO

Coated One or Two Sides Lithograph and Cover

Mills: Rumford, Maine

New York Sales Office: 200 FIFTH AVE.

A Nation Wide Service *for* Advertisers and Printers

Making your paper purchases a more profitable investment

THE most comprehensive paper service ever established has been inaugurated simultaneously in all of our branches clearing through headquarters in Chicago. It is for the firm who issues or prints advertising literature ranging from the smallest booklet up to catalogues the size of Montgomery Ward or Sears, Roebuck.

It covers the selection and use of the cheapest grades to paper and cover stock De Luxe, and every size and weight known to the paper business.

From folders to broadsides and from phantom weights to bristols as heavy as lumber, your every need is covered, as well as papers for every process of reproduction that will reproduce merchandise, products, or service, in a manner second only to the original.

The publisher will find our manufacturing service covers every grade of magazine book, from the cheapest to the best, any finish, any quality, any tonnage. Books, magazines, publications, each have a mission which is enhanced or retarded by the paper used.

SEAMAN SERVICE PAPERS

"For every printing need"

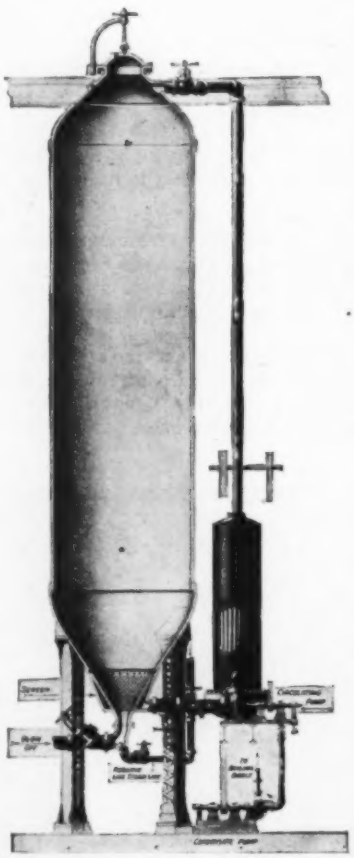
Seaman Paper Co.

1174, 208 South La Salle Street

Chicago

Complete Pulp Plants

Everything for the Manufacture of Soda and Kraft Pulp Ready for Shipment



It is not the most usual thing in the World, to have a ready made manufacturing plant to take down off the shelf and pass out to the first customer. We have several to offer.

Complete Diffuser and Digester Houses

JK 3100. Five complete digester and diffuser houses, capacity 80 to 100 tons of Kraft pulp (can be split in two units), each house containing 8 digesters, 8 washing tanks, 8 bleaching tanks (wood), and 8 pulp tanks (wood), 4 Blow tanks—one common to 2 digesters—catch tanks, etc. Four hot water tanks (wood) on steel towers outside the building, 6 Caustic tanks and 2 weigh tanks (caustic), elevator, bleach liquor storage tanks, 2 wooden outside storage tanks for black liquor of wood but useless for this purpose if wood pulp is to be made. All the necessary pumps, shafting, pulleys, etc. The whole building is built of steel covered in with galvanized corrugated sheet plate and the apparatus is driven with 2 Nordberg 250 h. p. Corliss engines—non-condensing. The main shaft which stretches the whole length of the building is stepped and rests in ring-oiled bearings on cement blocks. All floors are of wood. These units are most suitable for Kraft pulp manufacture.

NR 2011. One complete digester and diffuser house same as above.

MORTERUD PROCESS — DIGESTERS

SAVE COAL—SAVE TIME

NR 2011 A. Two welded steel plate digesters, 8 ft. in diameter x 27 ft. high. Test pressure, 165 lbs.; capacity, 1,300 cu. ft.; cradles, column, false bottom and heads included. To be sold either with or without Morterud attachment.

BOILERS	CHIPPERS	INCINERATORS	TANKS
BARKERS	DRYERS	PUMPS	COOKERS
BEATERS	EVAPORATORS	PULPERS	GRINDERS
CONCENTRATORS	FILTERS	SCREENS	TURBO-SETS

Let Us Know What You Need—We Can Supply It
Send for Pulp and Paper Section "T. P. ECONOMIST"

TECHNICAL PRODUCTS COMPANY

INCORPORATED

CHICAGO 501 FIFTH AVENUE, NEW YORK TORONTO

EVAPORATORS

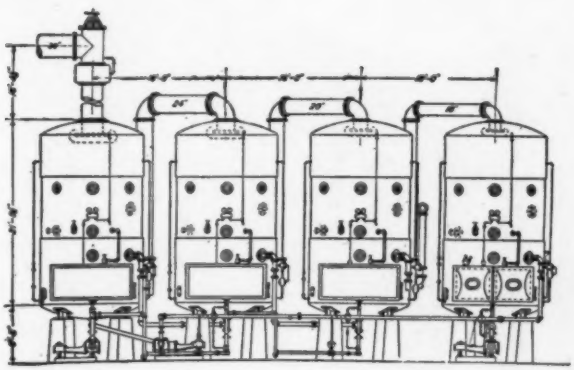
Standard Makes—Designed for Soda Pulp Mills
New Evaporators at Prices Below the Market
Used Equipment at Substantial Savings

Brand New Zaremba Evaporators

JK 3005. One Quadruple Effect Zaremba Evaporator; each effect 10 ft. in diameter and containing 3,000 sq. ft. of heating surface; complete with pumps, liquor testers, liquor and condensate controllers, etc.

JK 3005 B. Same as above, with 3,400 sq. ft. heating surface.

JK 3005 A. One condensing system, consisting of a counter-current barometric condenser and Laidlaw feather valve dry vacuum pumps suitable for both of above evaporators.



Yaryan Evaporators

CG 519. One triple effect Yaryan Horizontal Type Evaporator. Each effect 33″ in diameter, carrying 48 3″x12′ iron tubes expanded into brass tube sheets. Complete with 1 Blake-Knowles wet vacuum pump, cast iron jet condenser, feed and tail pumps, one new Yaryan heater, 450 sq. ft. heating surface, piping, regulators, etc.

Zaremba Evaporators

CG 184 GG. One triple effect Zaremba vertical type evaporator; cast iron shells 60″ in diameter x 13′ 2½″ high, 246 2″ charcoal iron tubes per effect, giving 450 sq. ft. heating surface; complete with 12x36″ jet condenser, American Marsh wet vacuum pump, feed pumps, steam traps, gauges, etc.

CG 184 HH. One single effect Zaremba horizontal type evaporator; cast iron shell, 60″ in diameter x 10′ 7″; 220 2″ charcoal iron tubes, giving 403 sq. ft. heating surface; complete with 12x36″ jet condenser, American Marsh steam vacuum pump, feed pump, steam traps, gauges, etc.

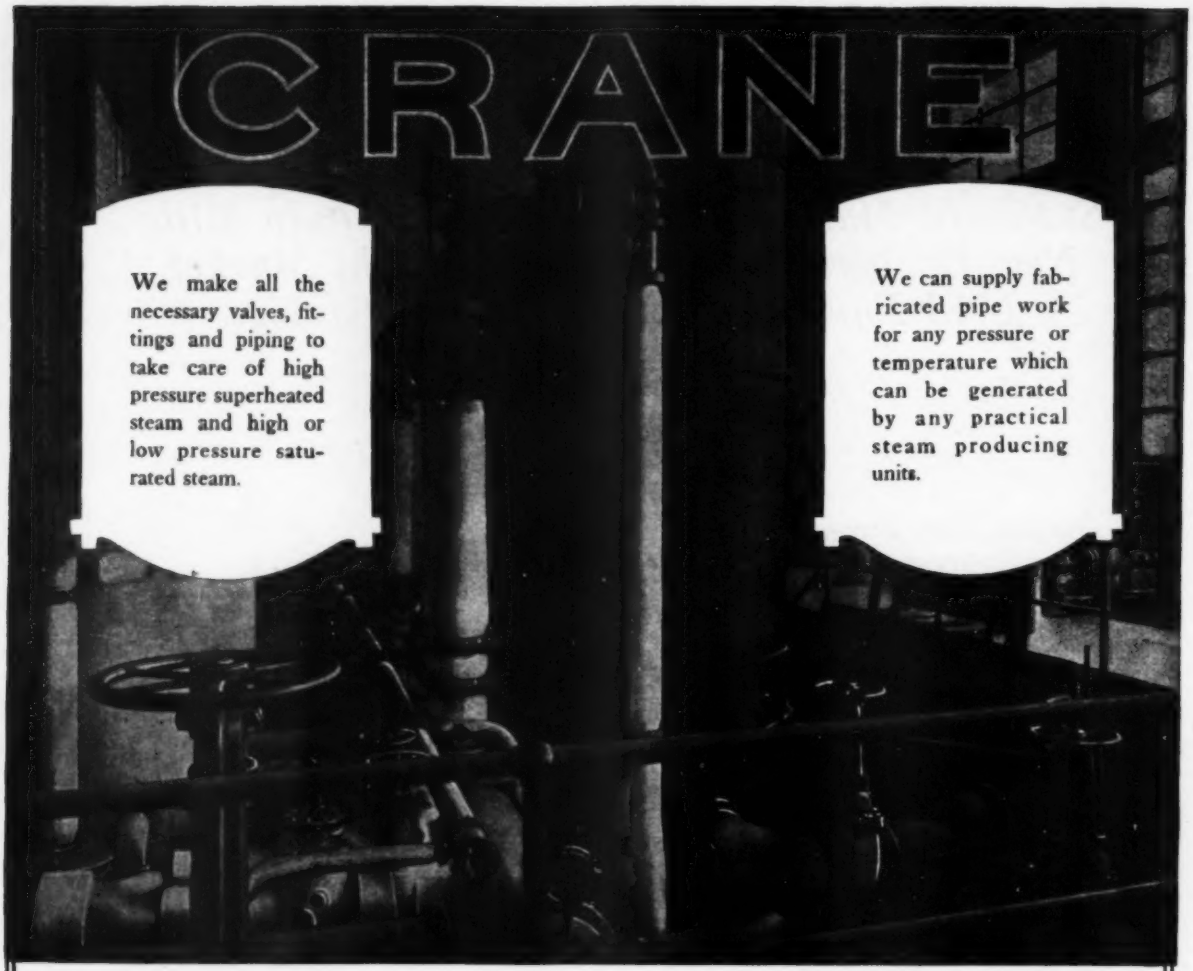
CG 184 FF. One triple effect Zaremba vertical type evaporator; ⅜″ steel plate shells 84″ in diameter x 16′; 522 2″ charcoal iron tubes per effect, giving 1,044 sq. ft. heating surface; complete with 2 jet condensers, 2 American Marsh steam vacuum pumps, feed pumps, steam traps, gauges, etc.

Send us specifications for any Power, Chemical, Pulp and Paper or Refrigeration equipment that you need. You'll save money buying from us. Get our Equipment List "T. P. Economist."

TECHNICAL PRODUCTS COMPANY

INCORPORATED

CHICAGO 501 FIFTH AVENUE, NEW YORK TORONTO


CRANE
We make all the necessary valves, fittings and piping to take care of high pressure superheated steam and high or low pressure saturated steam.
We can supply fabricated pipe work for any pressure or temperature which can be generated by any practical steam producing units.

CRANE
POWER PLANT EQUIPMENT

is designed with the object of producing an efficient system having the longest possible life, the least liability of a break-down, and a minimum cost of up-keep.

SALES OFFICES, WAREHOUSES AND SHOWROOMS:
BOSTON, SPRINGFIELD, HARTFORD, BRIDGEPORT, ROCHESTER, NEW YORK, HARLEM, BROOKLYN, ALBANY, PHILADELPHIA, READING, ATLANTIC CITY, NEWARK, CAMDEN, BALTIMORE, WASHINGTON, SYRACUSE, BUFFALO, SAVANNAH, ATLANTA, KNOXVILLE, BIRMINGHAM, MEMPHIS, LITTLE ROCK, MUSKOGEE, TULSA, OKLAHOMA CITY, WICHITA, ST. LOUIS, KANSAS CITY, TERRE HAUTE, CINCINNATI, INDIANAPOLIS, DETROIT, CHICAGO, ROCKFORD, OSHKOSH, GRAND RAPIDS, DAVENPORT, DES MOINES, OMAHA, SIOUX CITY

FOUNDED BY R. T. CRANE, 1855
CRANE CO.
836 S. MICHIGAN AVE.
CHICAGO

WORKS: CHICAGO AND BRIDGEPORT
ST. PAUL, MINNEAPOLIS, WINONA, DULUTH, FARGO, WATERTOWN, ABERDEEN, GREAT FALLS, BILLINGS, SPOKANE, SEATTLE, TACOMA, PORTLAND, POCATELLO, SALT LAKE CITY, OGDEN, SACRAMENTO, OAKLAND, SAN FRANCISCO, LOS ANGELES

CRANE LIMITED MONTREAL, TORONTO, VANCOUVER, WINNIPEG, LONDON, ENG., SYDNEY, N. S. W., QUEBEC, HALIFAX, OTTAWA, REGINA, CALGARY.

We are manufacturers of about 20,000 articles, including valves, pipe fittings and steam specialties, made of brass, iron, ferrosteel cast steel and forged steel, in all sizes, for all pressures and all purposes, and are distributors of pipe, heating and plumbing materials

The Bagley and Sewall Company

BUILDERS OF THE WIDEST *and* FASTEST RUNNING PAPER MACHINES IN THE WORLD

HARMON SCREENS

Flat and Inclined Type

Fan, Centrifugal & Plunger Pumps

Specialists in Rebuilding Old Machines

The
BAGLEY *and* SEWALL COMPANY
WATERTOWN, NEW YORK, U. S. A.

GEIGY COMPANY

INCORPORATED

89 BARCLAY ST., NEW YORK, N. Y.

ANILINE COLORS

Sole Selling Agents
for
J. R. GEIGY S. A.
BASLE, SWITZERLAND
Established 1764

Selling Agents
for
CINCINNATI
CHEMICAL WORKS
INCORPORATED
NORWOOD, OHIO

WE have recently greatly improved our laboratory facilities, which are at the disposal of American Paper Manufacturers for matching any required shades, or any other work.

Regular deliveries from both our American and foreign plants can now be made, which place us in a better position than ever to look after the wants of our customers.

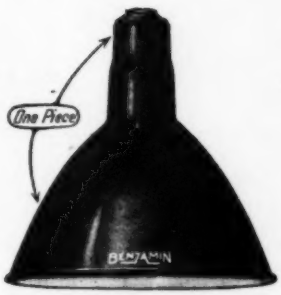
Watch for our page announcements in the coming issues of "The Paper Industry."

CROCEINE ORANGE NL

BRANCHES

Boston Providence Philadelphia Toronto Chicago
Columbus, Ga. Cincinnati

Securing Correct Illumination *for* Making Paper



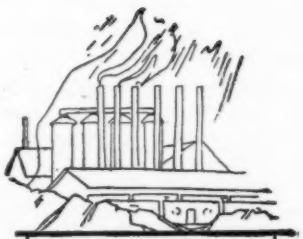
Seamless Deep Bowl Reflector Socket

FOR EVERY condition under which the activities of industry may be correctly illuminated, there is a type of Benjamin Reflector designed and made to suit that condition—the line is complete.

Each Benjamin Reflector is designed with a specialized knowledge of the degree of illumination required in conjunction with the placing of the light sources.

For the paper industry there are many specially designed Benjamin Reflectors to meet the variety of conditions particular to this industry—each of them producing daylight illuminating efficiency during the dark hours.

Put your problems in correct illumination up to Benjamin.



BENJAMIN PRODUCTS

The following are divisions of Benjamin products on which we will be glad to send information:

Industrial Lighting Division

Electrical Division (including Benjamin Two-Way Plug)

Pressed Steel Products Division

Enameled Products Division

Starrett Panel Board Division

For details, write the Advertising Department, 806 W. Washington Blvd., Chicago

BENJAMIN ELECTRIC MFG. CO.

Factories: Chicago and Desplaines, Ill.

Sales and Distribution Offices:

247 W. 17th St., New York 806 W. Washington Blvd., Chicago

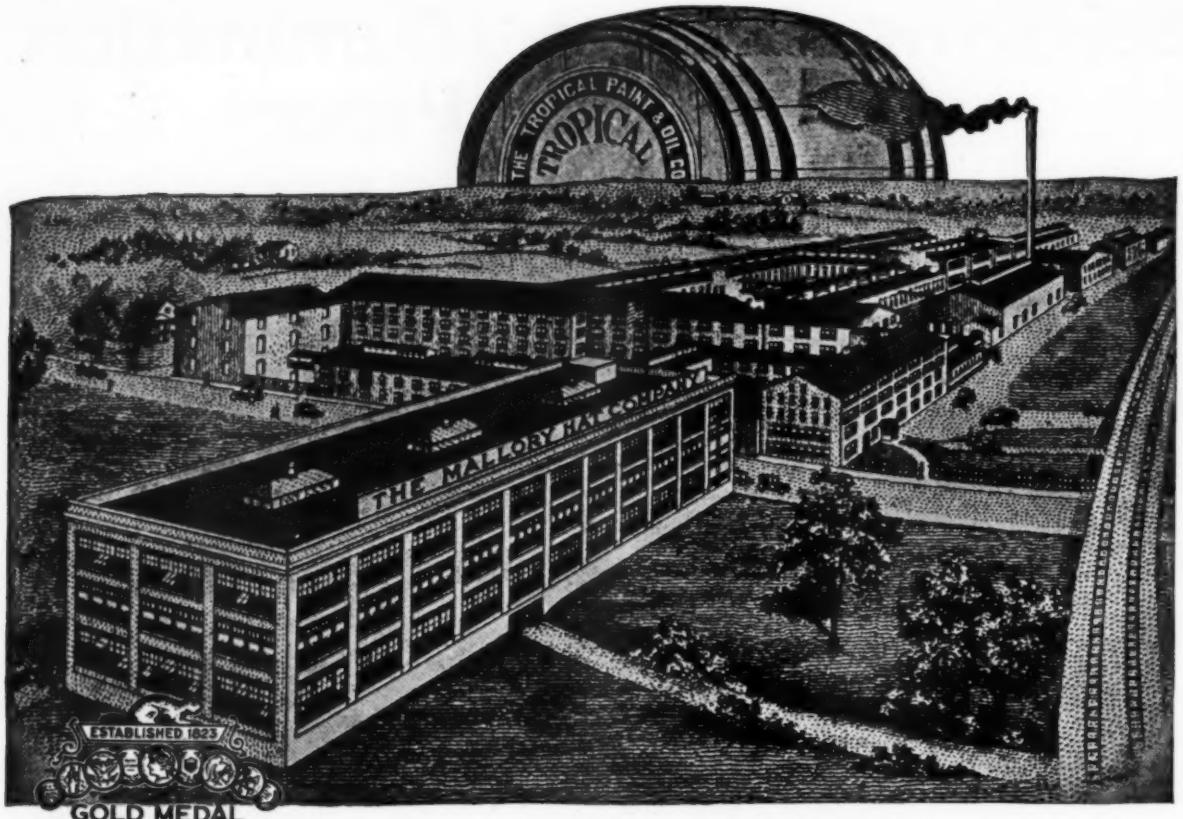
580-582 Howard St., San Francisco

Benjamin Electric Mfg. Co. of Canada, Ltd., Toronto, Canada

The Benjamin Electric, Limited, London, England

BENJAMIN

Makers of Things More Useful



GOLD MEDAL
PANAMA PACIFIC EXPOSITION

Mallory

NEW YORK

Since 1914
The Mallory Hat Co. has been using "Tropical" Paints

IT was nearly seven years ago that the Mallory Hat Co. placed its first order for Tropical Paint & Oil Co. products.

Each year since then this nationally known manufacturer of good hats has re-ordered "Tropical."

Tropical Elastikote protects the exterior of many of the Mallory buildings and saves the expensive waste of costly depreciation.

Toco Mill White brightens up the interior. It reflects the stimulating sunlight and helps the Mallory workers to maintain their high standard of workmanship.

There is a special "Tropical" product for every paint problem. And the formula of each has been perfected by years of specialization. You will be under no obligation by asking us to have one of our specialists call. He may be able to offer you some money-saving suggestions.

Protect the Surface with
ELASTIKOTE

Elastikote is a lasting protection for outside wood, metal and brick surfaces. Because of its wonderful elasticity it will not crack. Neither will it peel nor blister. We have prepared a test clearly demonstrating this elasticity which we shall be glad to send upon request.

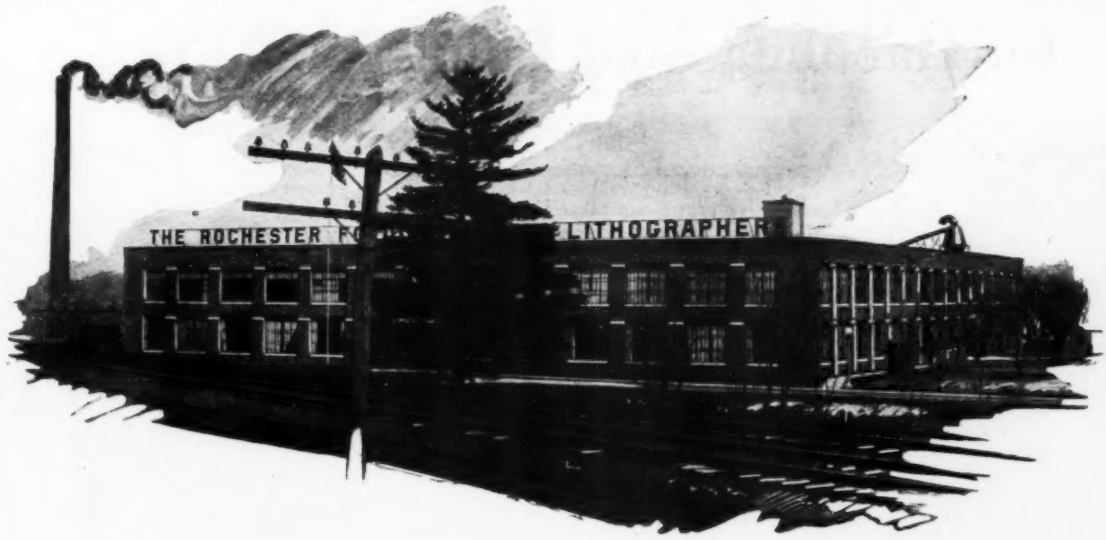
THE TROPICAL PAINT & OIL CO., Cleveland, Ohio

"The Firm that Serves with what Preserves"

THE TROPICAL PAINT & OIL CO. CLEVELAND, O. U.S.A.

TROPICAL

Paints—Enamels—Roofing Materials



The Rochester Folding Box Company, Rochester, N. Y., depend upon Sirocco and A B C equipment to help maintain the high quality of the product.

Materials and Men

The things of standing importance today are materials and men.

The quality of material turned out in your plant has all to do with the reputation on which your business stands.

High quality is only possible with good material and good workmanship. In the Paper Industry quality of the product is improved and the men enjoy better working conditions through the installation of the right type of ventilating equipment—A B C and Sirocco products. The Rochester Folding Box Company, one of the East's most progressive and aggressive firms use Sirocco products for conditioning the air in making folding box board.

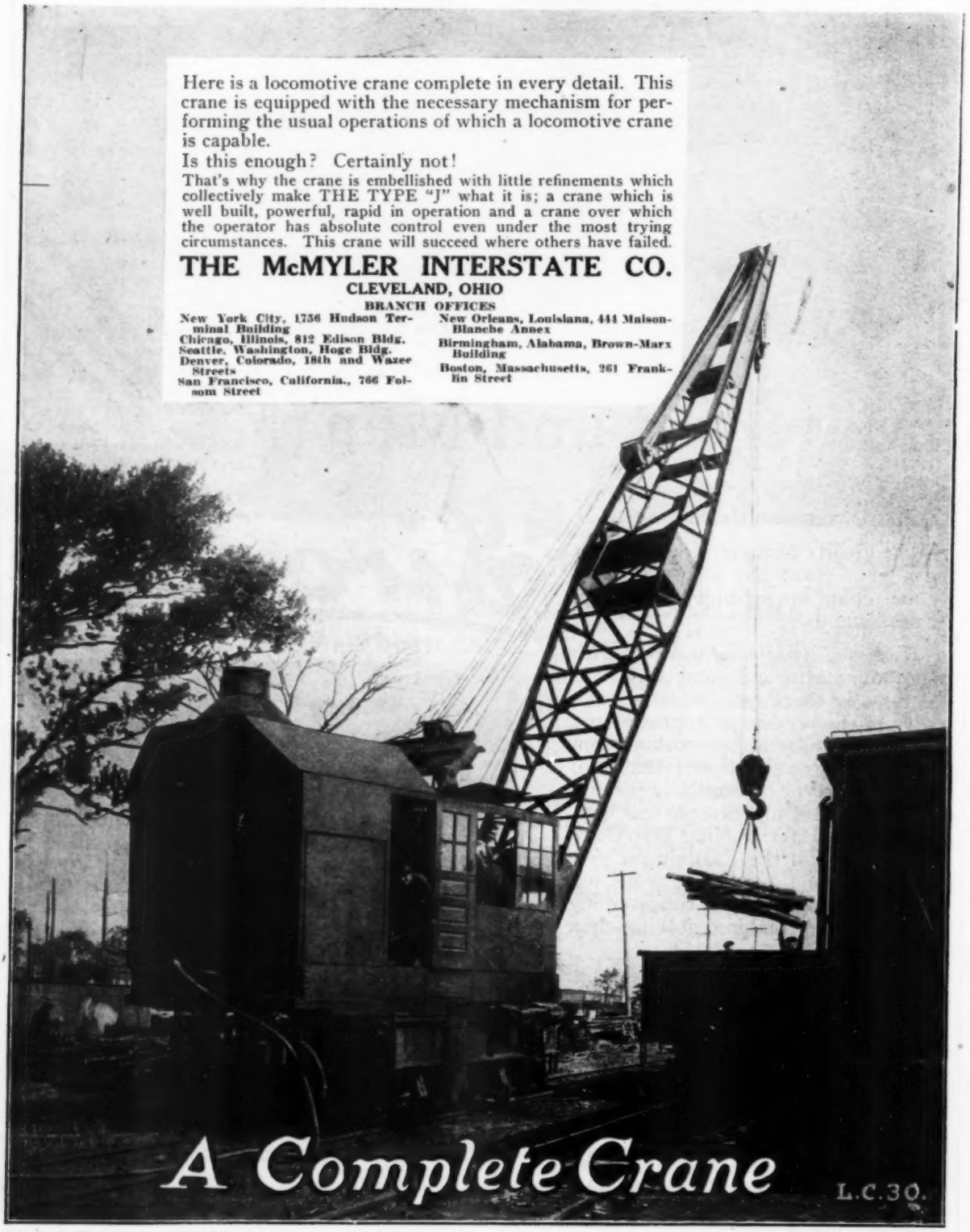
This whole subject of ventilating, heating and air conditioning in paper mills is covered in detail in our bulletin in A B C Equipment for Paper Mills. Would you like a copy?

American Blower Co.
DETROIT MICHIGAN

"Sirocco"
TRADE MARK

Driven side of "A B C" air conditioning apparatus and outlet for distribution of conditioned air.

Latest Development in Locomotive Cranes for Handling Coal, Pulp Wood, Etc.


Here is a locomotive crane complete in every detail. This crane is equipped with the necessary mechanism for performing the usual operations of which a locomotive crane is capable.
Is this enough? Certainly not!
That's why the crane is embellished with little refinements which collectively make THE TYPE "J" what it is; a crane which is well built, powerful, rapid in operation and a crane over which the operator has absolute control even under the most trying circumstances. This crane will succeed where others have failed.
THE McMYLER INTERSTATE CO.
CLEVELAND, OHIO
BRANCH OFFICES
New York City, 1756 Hudson Terminal Building
Chicago, Illinois, 812 Edison Bldg.
Seattle, Washington, Hoge Bldg.
Denver, Colorado, 18th and Wazee Streets
San Francisco, California., 766 Folsom Street
New Orleans, Louisiana, 444 Maison-Blanche Annex
Birmingham, Alabama, Brown-Marx Building
Boston, Massachusetts, 261 Franklin Street
A Complete Crane
L.C.30.

"MICHIGAN"

Combination Steel and Wood Pipe

LONG DISTANCE CONVEYOR OF WATER AND PAPER STOCK IN PAPER AND PULP MILLS
Specially Adapted to Carry Sulphite, Ground Wood and "White Water"

Eighteen reasons why you should use "Michigan" combination steel and wood pipe

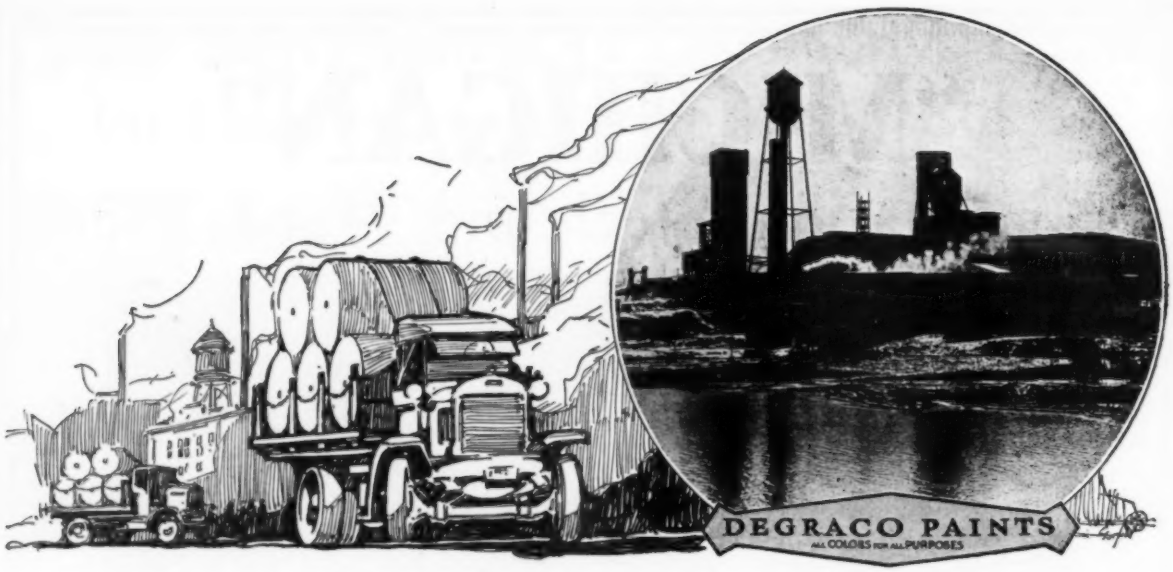
1—Durability of Wood Shell. 2—Sanitary. 3—20% more capacity than Cast Iron Pipe. 4—Simplicity in handling. 5—Light in weight. 6—Speed in laying. 7—Protects against freezing. 8—Not affected by Electrolysis. 9—Rigid inspection of materials. 10—Efficient construction of stave. 11—Strength of steel banding. 12—Protection of banding with asphalt coating. 13—Cannot burst under pressure. 14—Can be laid in a wet trench. 15—Short curves without specials. 16—Low installation and maintenance cost. 17—Responsibility of company. 18—Not affected by sulphur or chemical solutions.

THE MICHIGAN PIPE COMPANY

Dept. 17 **BAY CITY, MICHIGAN**

New York City, N. Y.....30 E. 42nd St.
Oklahoma City, Okla.....14 N. Dewey St.
Chicago, Ill.....Insurance Exchange Bldg.
Boston, Mass.....93 Broad St.
Cleveland, Ohio.....919 American Trust Bldg.
Chattanooga, Tenn.....702 James Bldg.
Montreal, Que., Canada.....204 St. James St.

"Steel for Strength—Wood for Durability"



Comparison—The Proof of High Quality

Where a particular paint is taken as the basis of comparison and used as a standard, it is an acknowledgment of its superiority and leadership.

When you hear people say that a paint is as good as ***Degraco Paint***—it is your assurance of safety and satisfaction if you buy ***Degraco Paint.***

There is a ***Degraco Paint*** specially manufactured to give maximum service on every paper mill surface—for every service requirement. Their reputation for leadership—maximum durability—lowest ultimate cost—is the result of satisfactory service covering a period of thirty years.

Whether or not you need paint ***now,*** you should read our paper mill maintenance book "Paints for the Paper Mill." It tells you how to most effectively meet every service and surface condition at lowest possible expenditure. Write for a copy today.

Detroit Graphite Company

Makers of
Paints in all Colors for all Purposes

503 Twelfth St. Detroit, U. S. A.

Sold through Branch Offices with warehouse stocks in all Principal Cities

Mfd. in Canada by Dominion Paint Works, Ltd., Walkerville, Can. (24)

Sta-White— a pure white, light-reflecting oil paint for industrial interiors. It stays white. The mill white you can rely upon.
Superior Graphite Paint—a protective coating for structural steel, bridges, metal roofs, stacks and all metal surfaces.
Degraco Paints and Enamels are made in all colors for use on interior and exterior surfaces, for every service requirement.
Degraco Brick and Concrete Paints—for interiors and exteriors. Concrete Walls, Floor Paint, Floor Hardener, Damp-proofing.
Degraco-Tone—an oil paint in flat finish for interior use on plaster walls, woodwork, wall board, concrete, tile, metal ceilings.
DEGRACO PAINTS
All Colors for All Purposes

When Will Paper Industry Advertise?

Brass Tacks—Favorable Public Opinion a Goodwill Asset and Square Deal Insurance—Interpreting an Industry to a Nation, and to Itself—What the Public Doesn't Know but Should—More Business for All the Mills—Propaganda, Outward and Inward

By C. H. BARR

Director Advertising Division, Crocker-McElwain Company—Chemical Paper Manufacturing Company; Treasurer, Paper Makers' Advertising Club

At a time when public confidence is so much needed, The Paper Industry believes that the ideas expressed by Mr. Barr in his article which follows, are worthy of serious thought, and we respectfully suggest that the matter be taken under consideration at the annual meeting of the American Paper and Pulp Association in April.—Editor.

DOES the public know anything about paper and the paper industry? Substantially, no. **Should** the public know anything about them? Unquestionably, yes.

Even to the man of business, paper is largely a riddle. Half the paper buyers don't know the value of a piece of paper by looking at it; half the paper sellers can't recognize their own paper if they meet it ten miles from home.

But the general public's notion of the paper industry? The general public has no notion of the paper industry. Paper, to the general public, is something that blows about the street, kindling for fires, yesterday's newspaper, trash to be salvaged. Paper, to the lay mind, is a by-product or offal of civilization, rather than one of the great keys of commerce, communication, culture and cleanliness. It is all very hard for a paper man to believe, this almost total lack of appreciation of the paper industry and its product. Yet practically the only exceptions to this rule are stenographers and printing employes.

What are we going to do about it? Well, it is our privilege and duty to bring the public **out** of its ignorance **into** a proper enlightenment and regard for our product and its place in society. To be specific, we hazard a very few of the many things we might teach the public:

1. To respect paper as the preservative of civilization's records.

2. To have at least a smattering knowledge on the **general subject** of Paper—"the story of paper," so to speak.

3. To understand in general how the paper **industry** functions.

4. To recognize good printing, whether it be a book. a letter, a catalogue, a report of proceedings, or a card. (A genuine appreciation of good printing would go far toward awakening the public's interest in good paper. Teaching children how their schoolbooks are made would be a real step in their education.)

5. To own good books rather than to borrow them or to depend solely on the public libraries.

6. To pay more attention to the little duties of politeness in sending cards, letters, acknowledgments, greetings, and friend-to-friend communications.

7. To keep an individual and family diary, as well as personal and family accounts.

8. To make all business transactions matters of record. (For the business man "verbal orders don't go"; for the head of a family, copies of correspondence concerning family business. The modern American family would find a typewriter a most useful adjunct to the home equipment.)

9. To make a roll of wrapping paper and ball of twine standard equipment for the kitchen.

10. To appreciate the purity and cleanliness of paper as a material for drinking cups, utensils, wrappings, packages, etc., for home as well as for office.

11. To prefer receiving foods from grocer and butcher wrapped and germ-proof.

12. To appreciate "the artistic" in candy boxes, hat and millinery boxes, suit boxes, shoe boxes, etc.

13. Finally, to save waste papers and rags in clean receptacles, in the home as well as at the office, disposing of them for "return to service."

It is unnecessary to extend these suggestions to cover-papers, blottings, glassines and on through the list; the instances given are representative. They are only a few of the many things the public might be educated to do which will consume paper and at the same time build prestige and respect for the paper industry as a whole.

Good Sense Begets Goodwill

True, such publicity will produce orders also. But in its preparation let us keep our writing hand free from salesmen's itch. Let us begin the publicity at a

time when there could be no question of motive. Let the work be handled by men **not too closely** engaged in the actual making of paper. Let not the public nostril sniffle from the smell of bleach.

As an example of the correct way of handling a goodwill campaign, Roy S. Durstine, in "Making Advertisements," speaks of the campaign of the American Telephone and Telegraph Company:

"Years ago this company started telling the public about the telephone, and today, even in the tangles of readjustment to a peace-time basis, the public has a great fund of patience and kindliness for the crippled service. In this advertising there was no idea of waiting until adverse legislation seemed imminent. One interesting, broad-visioned view of the telephone service to the country has followed another. With a background like this it is not necessary to cringe with an apology when an emergency arises."

Tell the public the story of paper: what of society's burdens it bears, and **what additional burdens society should expect it to bear** (here is where the orders come in). Has the industry a new cause or movement to promote? Tell the public. Anything pending, with big issues at stake for the industry? Get the confidence of the public and you'll get the squarest deal an industry could ask.

Some will object that an industry made up of so many companies, with such broad diversifications, can not advertise as a unit. What truth there is in this objection will be treated further on. But on the point of mere numbers, there are 10,000 grower-members in the California Associated Raisin Company; they advertise as a unit. On the point of diversification, we all recall the war publicity campaigns of our Government. Naval recruits, bond issues, bread substitutes, gasless Sundays, and a score of other activities got themselves advertised over Uncle Sam's signature. What can be more diversified than the interests of the British Empire? Yet hear the prediction of the Right Hon. Sir William Bull, M.P.:

"Some day—perhaps not far distant—the British Empire will officially advertise its products, its resources, and its opportunities, in the same manner, and by using the same media, as do the great department stores. When that day comes, we shall have taken our greatest step towards international understanding and goodwill."

"We Can't Make Enough Paper Now"

It may be urged that we should not attempt to increase the uses of paper. Some of us thought so seriously in the summer of 1920. But we have learned, no doubt, that a "paper shortage" is not imminent, and that a touch of salesmanship might safely be put into a goodwill campaign on paper.

Another objection may be made that advertising a whole industry is a precarious undertaking. Those conversant with advertising will know that collective advertising has a long and honorable record. Hardly a magazine can be found that does not carry the collective advertising of some industrial group. The cypress lumbermen, the pine lumbermen, the common-brick manufacturers, the face-brick manufacturers, the canners, the orange growers and lemon growers of the West and of Florida, are a few of the groups advertising under association names.

The story of paper is too big for one of us to tell. The public should hear the story, nevertheless, so the telling is plainly a collective undertaking. How fine it would be for the paper industry to have a distinct, friendly spot in the heart of the American people. To quote again from Durstine's "Making Advertisements":

"There is much to be said for the collective campaign. It offers an opportunity to speak for a whole industry and many a man will permit his industry to describe a situation of which he alone would hesitate to speak. The burden is carried on many shoulders and there is progress without individual hardship."

Organizing the Work

When it comes to the sales arguments, the subject seems to break into fragments. How can we talk oyster pails in the same advertisement with perfumed stationery, or bread wrappers with cover papers? Leaving the point a moment, let us consider the membership of the American Paper and Pulp Association in two directions: according to **function** and according to **product**; as follows:

FUNCTION	PRODUCT
1. The industry as a unit.	a. Writings.
2. Pulp mills.	b. Covers.
3. Paper mills.	c. Tissues.
4. Converters.	d. Books.
	e. Wrappings.
	Etc.

By thus arranging **function**-wise as well as **product**-wise, we split the difficulty into parts, each part a relatively simple case. How much the industry-as-a-unit viewpoint will obtain depends on conditions. The pulp mills, we might assume, are chiefly interested in legislation on fire-prevention and reforestation. On such matters, the industry's needs could at once become the public's knowledge. With equal facility the paper mills might go to their general or technical public with education on standards, ethics, trade customs, and similar matters. The converters, likewise, have a most interesting story of service to tell the public. Similarly each **product** group shown above has its peculiar publicity work to plan.

Now for organizing all this work. The arbitrary suggestions earlier in this article for getting more paper used were given mainly to add a touch of the practical to what some might consider all theory. But, ultimately, **drawing up a Prospectus of Publicity for the Paper Industry is the work of advertising men trained in the paper business, in consultation with several of the leading (from the standpoint of**

brains) advertising men of America, men representing the highest American business culture. The work is that of **interpreting an industry to a Nation.** The project would no doubt call for a Committee, the personnel of which might take the following form:

(a) Chairman—The Secretary of the American Pulp and Paper Association.

(b) One representative (preferably an active mill advertising man) from each Association of the American Paper and Pulp Association.

(c) The secretary of each Association in the American Paper and Pulp Association.

(d) Advertising counsel.

Alternatives in this arrangement easily suggest themselves. How the Committee would originate or to whom it would report need not be dealt with at this writing.

Propaganda—Outward and Inward

What to say to the public is important—only less important than one thing—what to omit. Discretion in omission is a kind of genius. Advertising the amount of money invested in the paper industry is of no interest to the public. Nor is the number of people employed, nor the tons of coal burned, nor the carloads shipped, nor properties involved. Tell the public who we are and what we are doing, and what more we **can do** to give the public **further service.** Teach the public how to use more paper intelligently; the knowledge is invited. Whatever we need as papermakers to the American people, we may boldly ask for and get if it is deserved. Only, of course, let us preserve a modicum of unselfishness.

Under a program of collective publicity, we are very apt to see that rare, delightful convention spirit which now manifests itself but a few days a year, crystallize into a constant attitude of fine courage and morale. The feeling that we are all moving forward together is the feeling that makes armies possible. In the army everybody is in the same fix; the boys either eat together or starve together. Whatever they have, they all have it. Otherwise envy and outraged justice would do to an army what they do to some business associations. Outward collective publicity should have a salutary **inward reaction.**

Another phase of this collective publicity is the Committee's opportunity for good in the employe-employer relation. The man who manages or owns a mill is employed by the same public that employs the beater-man and the backtender. We all together serve the common boss, the public. It would do us all good at times to circulate the idea **among ourselves** that we are all dependent for our pay upon the public using the paper we make. From porter to president, we must all keep out of our hearts every semblance of revenge for injuries received or assumed to have been received. How can it better be done than by emphasizing this common dependence on the public?

Something More Than Faith

How many men in the paper business have faith in advertising, is a question. There is no question, however, that most of us in the paper business get our living through the sale of paper **other** people use in **their** advertising. Thus, whether we have the faith or not, we are the beneficiaries of this great business force. If there be any maker of paper (fine paper in particular) who doesn't believe in advertising, his position would therefore seem a little awkward. As more advertising is done, more paper is bought. As business becomes modernized, more records are kept, more things written down, more copies taken, all of which calls for more paper.

It has been said that in some lines of business, in spite of tremendous increase in volume of goods sold, the number of companies has actually decreased, due to the domination by advertised brands. Whether the non-advertising companies in such lines are absorbed or pass into independent oblivion does not alter the plausibility of the statement.

Whether this greater-volume-fewer-companies force is at work in the paper industry is not under discussion. There are some things which the individual company will always rely upon itself to do or leave undone and take the consequences. The individual company which backs up a sincere philosophy of service with intelligent publicity will be "out front," just as sure as effect follows cause. The company which relies on one customer's promise or one man's personality must be content sooner or later to bring up the rear.

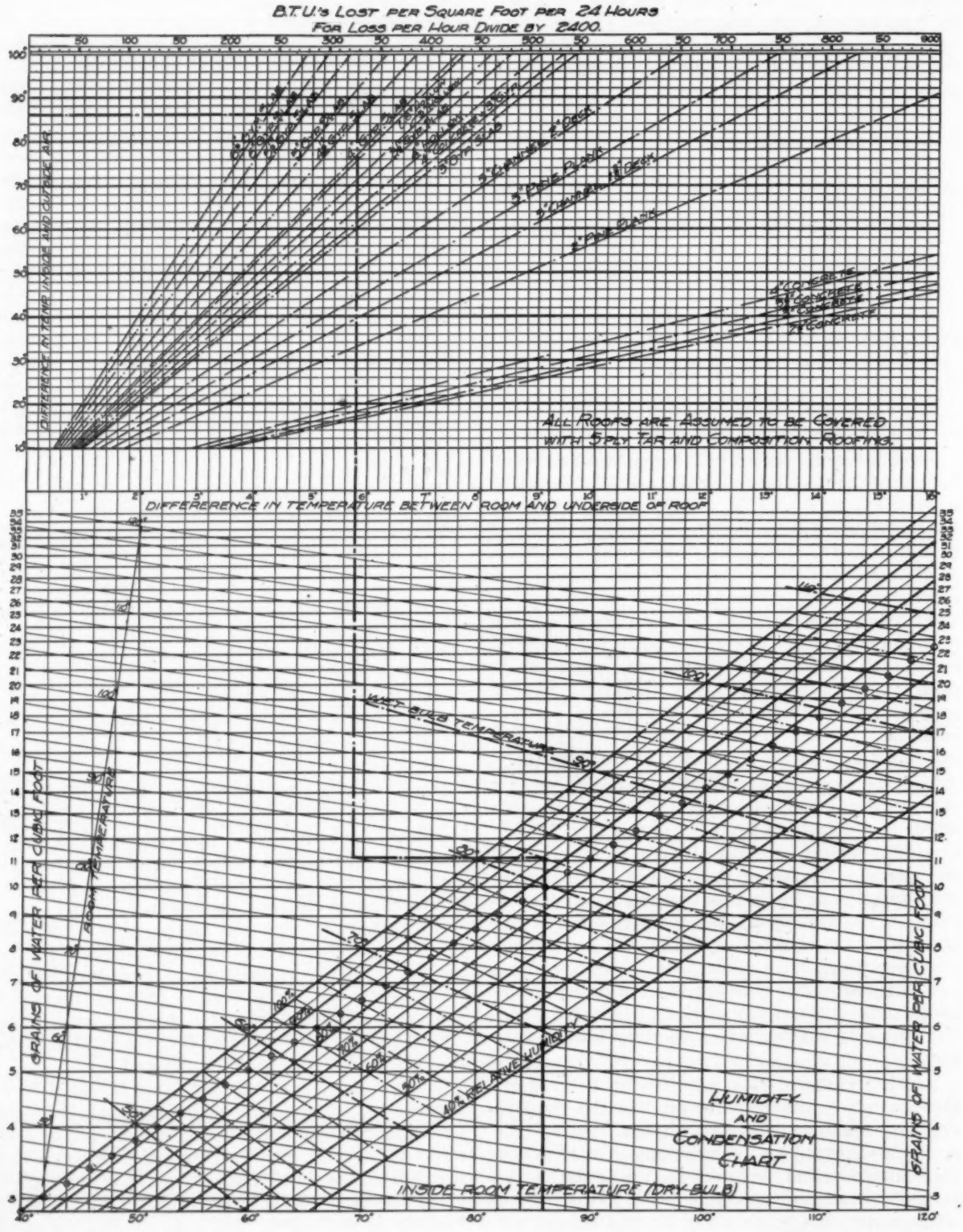
But by taking a part in interpreting our **industry** to the nation, we will each learn how to interpret our **individual company.** When we participate in a movement to secure more business for all mills, we will get a new and dazzling light thrown on the possibilities for our own company's products.

But perhaps greater than all the other benefits of collective advertising to the industry would be the conversion of the **beneficiaries of other people's advertising** (to wit: ourselves) to faith in the power and value of advertising as a business force. The ethical and spiritual elevation following such conversion would really be good for the soul.

When business men buy our paper to use in their advertising, let us learn to believe that they are paying us money not as misguided fools, but as constructive, careful, cultured men of business. For such are thousands of large consumers of our papers.

Let the paper industry go forward in the same faith as its customers. Let it go on with the same kind of strength it gives to others. If paper serves the builders of commerce, **let it also serve its makers** to build the paper industry to still bigger usefulness and importance in the world.

When will the paper industry advertise?


B.T.U.'s Lost per Square Foot per 24 Hours
For Loss per Hour Divide by 2400.
Difference in Temp. Inside and Outside Air
All Roofs are Assumed to be Covered with 5 Ply Tar and Composition Roofings.
Difference in Temperature between Room and Underside of Roof
Grains of Water per Cubic Foot
Room Temperature
Wet Bulb Temperature
Humidity and Condensation Chart
Inside Room Temperature (Dry-Bulb)
Grains of Water per Cubic Foot

With above chart any paper-mill owner can easily determine the kind and thickness of roof and the minimum expense required to do away with condensation in his plant. In order to compile the chart, numerous tests costing several thousands of dollars were made to ascertain the relative insulation value of various kinds of roof deck and roof covering materials. The compilations were made by the engineering department of the United States Gypsum Company in consultation with the country's leading heating engineers. Simplicity and accuracy were the paramount considerations in preparing the chart, the use of which is fully explained in the accompanying article.

How to Eliminate Condensation in the Paper Mill

By H. F. SMITH, C. E.

General Superintendent Fireproofing Department, United States Gypsum Company

INDUSTRIAL engineers, mill owners and architects are realizing more and more each day the great economy of preventing condensation in paper mills by the employment of a high insulating roof deck of gypsum. In this article are shown the several factors to be considered in the prevention of condensation, as well as the savings resulting from the use of a gypsum roof deck on a typical mill.

From the viewpoint of condensation, the machine room of the paper mill is the most difficult to control of all wet process plants. For every ton of paper made, it is necessary to evaporate at least an equal amount of water, which is given off from the paper machine in the form of steam or water vapor. In order to prevent condensation, this vapor must be removed from the room as fast as it is formed, by means of air changes. The number of air changes required is dependent on the amount of water evaporated per hour and the temperature of the air suspending the vapor.

We all know that the vapor carrying capacity of air varies greatly with the temperature; for instance, air at 100° F. will carry 20 grains of water for each cubic foot, while at 50° it will carry only slightly over 4 grains per cubic foot. This shows that the higher temperatures we maintain, the less air changes will be required to remove a given amount of water.

The controlling temperature in the case is not the average room temperature, but the lowest temperature found any place in the room.

When condensation occurs in any machine room, it does not necessarily mean that there are not sufficient air changes to allow the machine to operate efficiently, but that the temperature at the point of condensation is below the dew point. This can be illustrated as follows:

Suppose we find a thermometer reading 90° F. at a point a few feet from the roof slab. If the thermometer is placed in direct contact with the underside of the roof slab, we will find a drop in temperature of from 4 to 30 degrees, depending on the type of roof slab used. To prevent condensation then, our calculations for air changes must be based on the temperature of the underside of the slab.

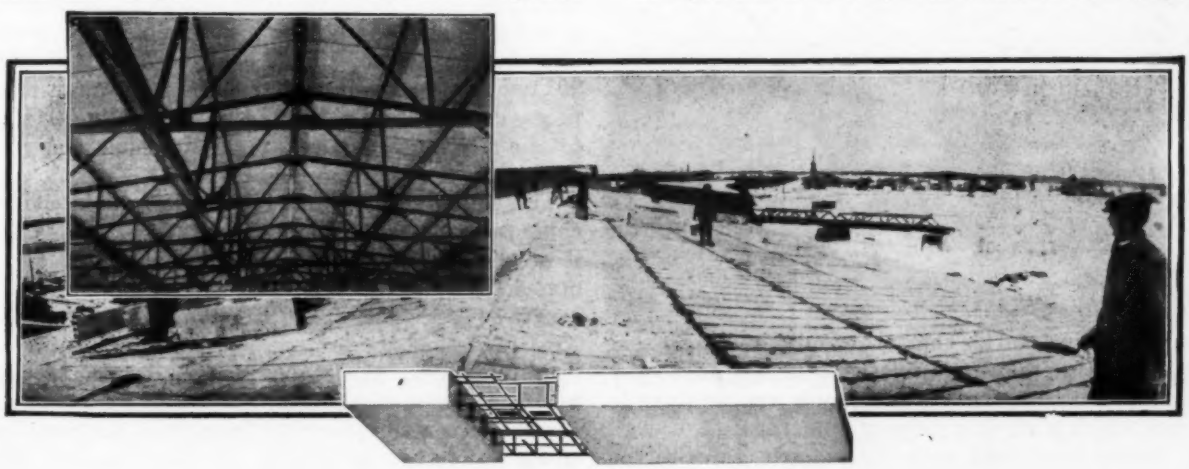
It is this cold roof which causes condensation to take place on it, even though the air a foot away from the roof is only 80 or 90 per cent saturated. In the past, designers have attempted to remedy this condition by putting steam coils close to the roof, but the results have been uniformly unsatisfactory, as this theory tried to correct the effect and not the cause of the trouble.

The only proper solution of the problem which corrects the cause of the trouble is to use a roof deck of highly insulating material such as is offered by gypsum tile.

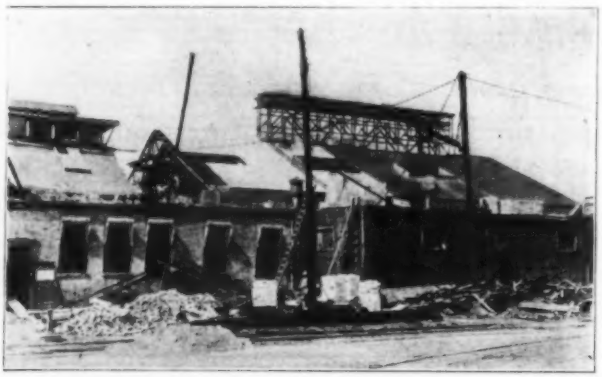
With a temperature of zero outside and an average room temperature of 95°, a 6-inch hollow gypsum tile will show a temperature of 86° on its under side, while 6 inches of concrete under the same condition will show a temperature of 70°.

The three factors—roof insulation, room temperature, and air changes—can be combined in various ways, any of which combinations can be made to prevent condensation.

The problem is to vary these factors so as to get



the most economical combination and still prevent condensation. If a designer is interested in low first cost without regard to maintenance of his system, he will put on a wood roof and make use of a high number of air changes at high temperatures. Such



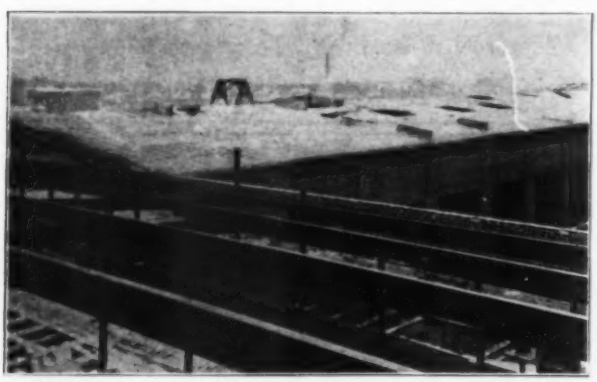
an arrangement may give satisfactory service and prevent condensation, but the cost of maintenance is very high. When large quantities of air are taken into the heating apparatus at low temperatures, say zero, and heated up to 120 degrees, or higher, it takes a great deal of coal, and when spread over a period of years, more than offsets the low first cost which the designer obtains.

The most economical combination is to use a reasonable number of air changes and a roof of high insulating value, such as is given by gypsum roof tile.

The Humidity Chart

The Humidity Chart, on page 1834, affords a means of determining the proper type of roof deck to prevent condensation under any machine room conditions.

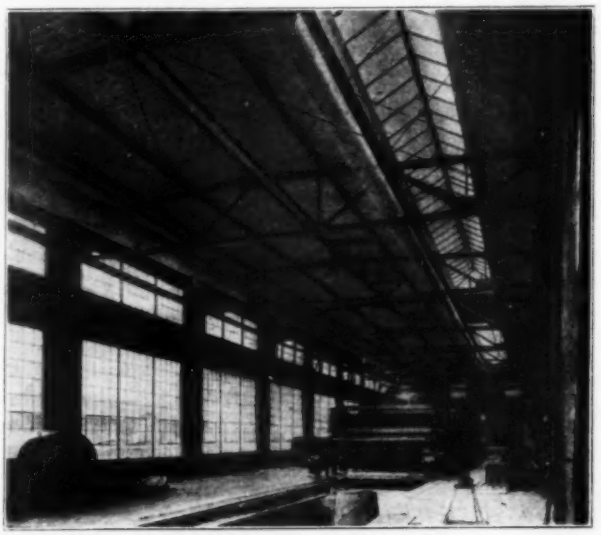
Example—Assume a machine room of about 4,000 sq. feet of floor area with a single machine turning out about 25 tons of paper per day, with a total water evaporation of, say, 2,000 pounds per hour. We will assume an average room temperature of 90°, and



in calculating our air changes will design the system to maintain an average relative humidity of 85 per cent. Say that the lowest outside temperature is zero, which gives us a range of 90°.

Before continuing with the example, refer to the Humidity Chart on page 1834. Note the co-ordinates on the bottom of the page giving the inside room temperature and the wet bulb temperature, given on the upper diagonal line. The intersection of any two readings of wet and dry bulb temperature give a point from which we can read directly (on the diagonal lines) the relative humidity, and from the figures on the right hand margin, find the number of grains of water in each cubic foot of air for the given conditions. In the same way, the intersection of the two co-ordinates, inside room temperature and relative humidity will give us the wet bulb reading and grains of water per cubic foot.

Returning to our problem, we are now ready to calculate the number of air changes required to remove the vapor from the machine as fast as it is given off. Two thousand pounds of water per hour multiplied by 7,000 grains per pound and divided by 60 minutes gives us 233,100 grains of water evap-



orated per minute, which must be carried out of the room suspended in air.

On the chart find the intersection of the 90° room temperature line with the diagonal line for 85 per cent humidity. From the intersection go horizontal to the right and read 12.8 grains per cubic foot. Now if each cubic foot of air, 85 per cent saturated and 90° temperature, will carry 12.8 grains of water, it is necessary only to divide 233,100 by 12.8 to get the total air changes required, or 18,300 cubic feet per minute.

There is a "rule of thumb" that the air in a machine room should be changed every 7½ minutes, so if we take our 18,300 cubic feet, multiply by 7½ minutes and divide by 4,000, the floor area of the room, we get 34 feet, which is the proper height to the roof. Next let us find the proper roof slab to prevent condensation under these conditions. Return to our point of intersection of the 90° room temperature and the 85 per cent humidity lines, trace horizontally to the left to the intersection with the diagonal 100

per cent humidity line, and then vertically down to the inside room temperature of 84°. This means that if our air drops to 84° it will be 100 per cent saturated and condensation will take place. It is necessary then to supply a roof which will not allow the temperature in the under surface to drop to 84° even in zero weather, subtracting 84° from 90 gives a critical temperature drop of 6°.

Note the figures on the horizontal line at the base of the upper half of the chart, a "Difference in temperature between room and under surface of roof." Find the point of intersection of 6° (as given above) and 90° difference in temperature between inside and outside air (range). This is the critical point at which condensation takes place. Any type of roof represented by the diagonal lines to the left of this point will prevent condensation, as the temperature of the under side will always be above 84°. Note that a 5-inch gypsum slab is the proper answer to our problem.

Again assume the same condition as above, except that the mill owner has decided to use a 2-inch plank roof on account of its apparent low cost. In the upper set of curves, find the intersection of the 90° range line and the diagonal line representing a 2-inch plank roof, and read down to a temperature drop of 15.8°, subtracting this from 90°, our air room temperature, gives us 74.2°, the temperature of the under side of the roof slab, which is our critical temperature on which to base our air changes to prevent condensation. From the lower set of curves we see that air at this temperature, 95 per cent saturated, carries but 8.8 grains per cubic foot. Dividing 233,100 by 8.8 gives 26,500 cubic feet of air changes per minute to prevent condensation, or 8,200 cubic feet per minute more than is required with the gypsum roof.

Figuring the cost of coal at $8.00 a ton in the boiler, it would cost approximately $480 each winter to heat this additional air. Adding $40 to this, the cost of the power to run the fan required for the additional capacity, would give a total waste of $520 per year.

Assuming that the gypsum roof would have a life of twenty years, the mill owner could well afford to pay 20 times $520, or $10,400, more for a gypsum roof than for the 2-inch plank roof, even if the plank roof would last 20 years.

In a few years' time the saving shown above would pay for the difference in cost of the gypsum roof, and after that time would mean "more dividends" for the owners.

As this type of gypsum roof costs only 20 or 30 cents a foot more than the 2-inch plank roof, and is permanent and fireproof, obviously it is poor economy to consider only the first cost, and not take advantage of the continuous saving of a gypsum roof.

The Testing of Sulfite Pulps

By E. G. MILHAM, Chem. Engr.

Bryant Paper Co.

DURING the past few months, the writer has received numerous requests from paper mill men for information concerning the methods commonly used in testing sulfite pulps. These requests have led the writer to believe that a description of the methods in question would not be out of place here.

The tests usually made on sulfites at the present time are **moisture, color, dirt,** and **strength.** The methods for carrying out these tests are fairly satisfactory and have been used successfully in many laboratories for some time. However, the methods are by no means "fool proof" and consequently, if reliable results are desired, it is absolutely necessary that great care be taken and that directions be followed to the letter. This last statement applies especially to the method used in testing for strength.

Sampling

Of course, the first step necessary in making any kind of test is the obtaining of an accurately representative sample. This may strike some readers as being of minor importance. As a matter of fact, however, no test made on pulp is of any value whatsoever if that pulp was sampled in a careless manner. This is a point which all persons connected with the testing of pulp, or anything else for that matter, should bear constantly in mind.

The directions for sampling which have been recommended by the Technical Association of the Pulp and Paper Industry, and which are being used in most all of the up to date mills are as follows:

1. Samples from baled pulps are obtained by boring into the bale to a depth of three inches with a special auger, which cuts a disk about four inches in diameter. As soon as cut, the disks are removed from the bale and ten of them selected as follows: one disk second sheet from the wrapper, two disks on inch deep, three disks two inches deep, and four disks three inches deep.

It is essential that the holes in the different bales be located with reasonable care. The hole in the first bale is bored in the corner in such a way that the edges of the cut are at a distance of one inch from the edge of the bale. The second bale is bored so that the hole will lie half way between the location of the first cut and the center of the bale. The third bale is cut at the center. The fourth bale is

bored in the same relative position as the second, and the fifth bale in the same relative position as the first. If the holes are located as described, the samples from five successive bales will represent a portion extending diagonally across the bale. In selecting these bales, it is important to note that not less than five per cent of the total number in the car must be bored if a good sample is to be obtained. In cases where a car contains less than 200 bales, at least ten of these should be bored, regardless of the fact that this may be more than five per cent of the total number in the car.

2. Samples from rolls are obtained in much the same manner as samples from bales. The same type of auger is used and the same procedure is followed, with the single exception that the five positions for the holes are taken at equal intervals along the face of the rolls instead of across a diagonal, as in the case of baled pulp. Borings should be taken from at least five per cent of the total number of rolls in the car.

3. Samples from lap pulp are obtained by cutting wedges from one per cent of the laps in a car. The wedges are two and one-half inches wide at the base, and extend to the center of the lap. Their thickness is one-half the thickness of the lap. The cuts are located in such a way that wedges from four successive laps will represent pulp from all four edges of the laps. In other words, none of the four wedges from any four laps will be in the same relative position. The wedges can be cut very conveniently on the trimmer, which is available in nearly every paper mill finishing room. It is needless to say that all samples should be placed in an air tight can as soon as they are cut. The total wet sample taken should weigh at least three or four pounds.

As will be noted from the foregoing descriptions, the matter of properly sampling pulp is by no means a simple proposition. It is a thing which cannot be covered by standard instructions and which, therefore, requires close observation, careful thought, and good judgment on the part of the person doing the testing. At the present time, there are far too many pulp tests being made on samples which are absolutely worthless because the detail of sampling was left to a careless, ignorant, or incompetent person.

Testing for Moisture

After an accurately representative sample has once been obtained, it is a relatively simple matter to determine the moisture content. The complete apparatus required for the test may be obtained from the William's Apparatus Company, Watertown, N. Y. It consists of the following: One balance of five kilograms capacity, and sensitive to one gram. One electric drying oven equipped with a thermometer and a controlling device capable of holding the temperature of the oven constant to within two or three degrees of 212°F.

As soon as the sample arrives at the laboratory, the portions to be used for strength and dirt tests are immediately removed as described below and the balance of the sample weighed as rapidly as possible in order to avoid the loss in moisture which quickly takes place when wet or moist pulp is exposed to the air. The sample is then put into the drying oven and kept at a temperature of 212°F. for 24 hours. At the end of the drying period, the sample is removed from the oven and immediately weighed. The weight of the wet sample, multiplied by 100, and divided by weight of the dried sample, gives the percentage of bone dry material in the pulp. The percentage of bone dry pulp divided by 0.9 gives the percentage of air dry pulp, and the difference between the percentage of air dry pulp and 100 is the percentage of excess moisture. The figure for percentage of air dry pulp is of very great importance, because all pulp is bought and sold on an air dry basis. In other words, the amount to be paid for a given lot of pulp is arrived at by multiplying the actual wet weight of the pulp by the air dry percentage, and multiplying this result by the price per pound. Thus, it is obvious that it is absolutely foolish for a buyer of pulp to carefully check up the wet weight of pulp received and at the same time fail to make a test for air dry content. In the opinion of the writer, a careful moisture test should be made on every car of pulp purchased.

Testing for Color

The examination of pulp for color is a very simple matter in the eyes of the uninitiated, but to the experienced papermaker it is an extremely difficult proposition. The chances are that many of the readers of this paper have often noticed how two pieces of pulp will appear identical in shade on a clear day and very different in shade on a dark day. Further than this, probably many have also noticed how different pieces of the same pulp often appear to be of different shade when graded together under identical light conditions. The reason for all this lies in the fact that the apparent shade of a piece of pulp depends largely upon the surface of the pulp and upon the light conditions under which it is examined. Thus it is evident that in order to accurately compare colors of pulps, it is necessary to eliminate the two variables of light and surface. The light factor is standardized by the use of a daylight lamp. The lamp generally used at present is known as the Arc Type of Color Comparator, and is made by the General Electric Company. This lamp should, of course, be used in a dark room.

The matter of standardizing the surfaces of different pulps is not quite so simple. At present this is accomplished by revolving the pulp, together with the standard, at a high speed (2500 r.p.m.). This, of course, does not standardize the surface of the pulps, but minimizes the effects of different surfaces, which amounts to the same thing. The apparatus

for doing this work consists of six brass wheels mounted so that they can be driven by a single belt. These wheels may be made from solid brass disks eight inches in diameter by one-half inch in thickness. A groove two inches wide and one-fourth of an inch deep is cut into the face of each wheel, the inner edge of the cut being about one and one-half inches from the center of the wheel. The width of the groove tapers from two inches at the top of the cut to two and one-half inches at the bottom of the cut. This makes it possible for the groove to rigidly hold the plaster of Paris which is subsequently poured into it. The plaster of Paris is the material which furnishes the permanent standard color for the comparisons. Different standard shades are obtained by mixing varying amounts of magnesia and chromate of potash with the plaster of Paris. For testing the colors of bleached sulfites, the following formulas are used in preparing the fillings for the standard wheels:

Wheel Number	Color Rating	C. C. of Water	Grams of Plaster Paris	Grams Chromate of Potash	Grams of Powdered Magnesia
1	100	120	107	.....	20
2	95	120	107	0.0245	20
3	90	120	214	0.1490	..
4	85	120	214	0.4660	..
5	80	120	214	0.6120	..
6	75	120	214	0.7770	..

The plaster of Paris and magnesia are thoroughly mixed, dry, then the water is added and the paste thoroughly stirred up and quickly poured into the wheel. In the case of wheels containing chromate of potash, the latter is dissolved in the 120 c.c. of water, and the solution added to the plaster of Paris. About 48 hours after pouring, the wheels are revolved by means of the motor, and smoothed off with a sharp chisel and fine sandpaper. The proper preparation of the standard wheels is by no means an easy task.

Operation of the Color Testing Apparatus

After the apparatus, including the daylight lamp, has once been obtained and set up in a dark room, the actual testing for color is a very simple matter indeed. In carrying out the test, six disks of pulp, three and one-half inches in diameter are cut from the two hand mould sheets, made in connection with the test for strength. A three-eighth inch hole is punched in the center of each. One of these pulp disks is then fastened to the center of each of the six standard wheels of the color testing machine by means of five-sixteenth inch set screws located in the exact center of the face of each of the wheels. The power is then turned on and the six wheels revolved at 2500 r.p.m. It is then an easy matter to tell which one of the wheels matches the shade of the pulp most closely. The color of the pulp is rated according to the rating of the wheel which it comes closest to matching. The results of this test are very satisfactory if carried out with ordinary care, and the method, as a whole, goes a long way toward putting the designation of color on a scientific numerical basis.

Dirt

The examination of pulp for dirt is a very simple matter indeed. The sample for this test should contain at least 50 grams of air dry pulp and is carefully selected from the main moisture test sample. The billed air dry test, as furnished by the pulp mill is assumed to be correct and, on this basis, the equivalent of 50 grams of air dry pulp is weighed out from the sample withdrawn for the dirt test. The pulp in this 50 gram sample is split into its ultimate sheets, as made on the wet machine at the pulp mill and the individual sheets thoroughly soaked with water and spread out on a specially constructed box. This box is provided with a glass top, a mirror bottom, and two 100 watt Tungsten lamps. The dirt specks are then counted and rated in the following manner: Specks less than .04 inch in diameter count as one. Shives and specks between .04 and .08 inch in diameter count as two, and those over .08 inch in diameter count as three. The results of these counts are added and the sum multiplied by two. This gives the total dirt per 100 grams of air dry pulp. The test is a very valuable one and should be performed on every car of pulp received.

Strength

The testing of sulfite pulp for strength is a comparatively difficult matter. The method used has a few apparently unavoidable faults and the results of tests performed by inexperienced persons are very unreliable. The writer, however, has found the method fairly satisfactory in spite of its limitations and does not hesitate to recommend it to those who are willing to spend a little time acquiring the necessary experience. The apparatus required for the test is as follows:

One jar mill "C" manufactured by the Abbe Engineering Co., 218 Broadway, New York; one hand mould 7 by 9 inches inside deckle, manufactured by T. J. Marshall & Co., Ltd., Stoke Newington, London, England; one hand letter press not less than 9 by 11 inches; one Ashcroft paper tester (0 to 140 pounds range) made by Ashcroft Mfg. Co., New York; one sink about 14 by 18 by 16 inches (deep); one hygrometer, obtainable from any laboratory supply house—this instrument is not entirely necessary, but acts as a valuable guide in testing.

The first step in the actual testing for strength is the drawing of a representative sample (equivalent to 100 grams of air dry pulp) from the main moisture test sample. Obviously this must be done with rapidity and care. Here, as in the case of the dirt sample, the air dry test furnished by the pulp mill is assumed to be correct and, on this basis, a sample equivalent to 100 grams of air dry pulp is weighed

up. This is placed in a ten quart pail and kneaded up with exactly 1500 c.c. of water, until no lumps are left. The mixture is then poured into the jar mill and the pail rinsed out with a quantity of water sufficient to bring the total amount of water in the mixture up to 2000 c.c. A charge of 4900 grams of pebbles is dumped onto the pulp mixture in the mill and the latter tightly closed. The mill is then revolved for exactly 50 minutes at a speed of exactly 60 r.p.m. At the close of the 50 minute period, the pulp and peebles in the mill are rinsed into the ten quart pail. This is then emptied onto a one-half inch mesh strainer supported directly above the special sink. The peebles are carefully rinsed with a hose until all the pulp has been washed into the sink beneath. Water is added until the total volume of the mixture becomes 20 liters, as indicated by the level of the mixture reaching the 20 liter mark previously made upon the sink. The pulp mixture is thoroughly stirred and a sheet dipped up by means of the hand mould. This sheet is then couched on a moist 9 by 11 inch piece of first felt, which has been evenly spread out upon a 10 by 12 inch piece of heavy galvanized iron. After the sheet has been successfully transferred to the felt, it is covered with another piece of felt and another sheet is made in a manner similar to the first. This process is continued until six sheets have been made. The pile is then topped with another piece of galvanized iron and squeezed in the letter press for exactly two minutes. When this has been done, the sheets are removed from the felts and spread out on a machine wire frame supported on top of the pulp drying oven. After about an hour, when the sheets have become thoroughly dry, the first four sheets dipped are quickly weighed to the nearest hundredth gram and cut diagonally, while the last two sheets made are laid aside for the color test. Each half of the four sheets cut is then tested with the Ashcroft tester in four equally spaced places along the diagonal. The sum of the 32 tests thus obtained, divided by twice the weight of the four sheets gives the strength of the pulp.

Conclusion

In conclusion, the writer wishes to make the following comments regarding the above methods:

1. For quick color comparisons the use of the color matching machine may be dispensed with. However, the comparisons should be made on hand mould sheets to eliminate as nearly as possible the factor of pulp surface.

2. Colors of unbleached sulfite, soda, and ground wood pulps may be tested by means of the color matching machine if suitable standard disks can be prepared.

3. Strength tests may be applied to unbleached sulfite, sulfate, and soda pulps, but not to ground wood pulps.

4. Some claim to prefer the use of the suction mould to that of the hand mould for forming the test sheets. The writer, however, has had the best results with the hand mould.

5. Strength test results obtained on different pulps by one operator are comparative among themselves, but are not necessarily comparative with results obtained by other operators using different apparatus.

6. The strength test, in spite of its faults, gives very valuable information to those whose powers of observation have been sufficiently developed.

7. Time and money spent in making these tests pay large returns if the results are properly followed up.

Uniformity of Digester Chip Charges

HOW uniform are the weights of wood in the digester charge, the unit commonly used in chemical pulpmill operation, is indicated by data obtained in a mill-scale study by the U. S. Forest Products Laboratory. For a period of three months at a certain mill, it was possible to weigh all the chips entering one digester, to make accurate determinations of their moisture content, and so to compute the actual amount of wood substance in each charge.

The chip charges for thirty-eight cooks showed the following variation in weight, after deducting for moisture:

7 charges weighed between 11,600 and 12,600 lbs.
24 charges weighed between 12,600 and 13,600 lbs.
7 charges weighed between 13,600 and 14,600 lbs.

Fifty per cent of the charges contained between 13,000 and 13,770 pounds of chips—a variation in weight within the limits of plus and minus 2½ per cent. Delays of more than 24 hours occurred in starting all the cooks with charges of more than 13,770 pounds, and, since it was customary before bolting down the cover to fill with additional chips the space left by the settling of the charge, the longer filling periods account for the larger amounts of wood in these charges. The cooks with charges of less than 12,600 pounds were started without refilling after the liquor charge was added, and it was anticipated that they would be light.

The weighing experiments indicate that the digester charge is, in most instances, a reliable unit for pulpmill operation, provided the operation is uninterrupted and the soundness and species of pulpwood do not vary.

Before you tell a filthy story think of your mother, your wife, or your daughter says the National Safety Council.

Engine Guarding and Engine Stops

Prepared by the Engineering Section of the National Safety Council

THE engine-room is universally recognized as a hazardous department.

An engine-room should have at least two means of entrance and exit, each of which should be easy of access and within reasonable view of the engineer in charge. (Too many entrances, however, for obvious reasons, are inadvisable.) All passageways and exits should be free of obstructions, and doors should open outwardly and should not be so close to operating equipment as to create a hazard. Basements of engine-rooms should have exits so arranged that men may not be trapped in the basement.

A sign should be conspicuously posted outside each doorway forbidding entrance except on business.

If entrance ways are kept open for ventilating or other purposes, bars or gates should be placed across the entrance.

A gallery for visitors is sometimes provided, as the department exercises a fascination for plant visitors. Entrance to such a gallery is preferable by an outside stairway. If entrance to the gallery is from the main entrance, substantial guard and intermediate rails should clearly prescribe the limit of welcome, and signs indicating entrance to gallery should be displayed. The gallery or balcony should be of fire-resisting construction, rigidly built, and should be securely railed to a height of at least forty-two inches, with intermediate rails and toe-boards, or the space between the top rail and floor entirely filled in. Conversation between visitors in gallery and engineers or assistants in room below should not be permitted.

Floor of engine-room should be of concrete or abrasive surface to eliminate the slipping hazard. When approach is had to any engine or machine, the non-slipping provision should be emphasized. Frequently inserts or mats of non-slip material are used at these points when the entire floor is not of non-slip material.

Guards on Engines

Fly wheels should be guarded as follows:

Where the guard is not less than fifteen inches from the wheel, by a railing the top rail of which is at least 42″ from the floor, with an intermediate rail midway between top rail and floor and a toe-board at least 4″ high at the base of the railing. Such guards should be not more than twenty inches from the wheel.

Where guard is less than fifteen inches from the wheel, it should be not less than five feet high (unless wheel is less than five feet in height, in which event guard need not extend above wheel), and should be a solid guard or a mesh guard with openings not greater than 1½″ in any direction.

Fly wheel guards should be carried over the bearings at the same relative height as the guard on the floor and should be of the same construction as to size of openings in guard.

A disk guard of metal or fibre is considered safe on balance wheels not more than five feet in diameter, where they do not extend through the floor. Such disk guards should be so attached to the wheel as to protect the spokes. When space is left between edge of disk and rim of wheel, to facilitate turning wheel over, it should not exceed 2½″ in width. When disk guard is used, see that keys or other projections in hub or rim of wheel are guarded.

No door or gate should be allowed in fly-wheel protection, except at gas or oil engine where such provision may be necessary.

Crank shafts, connecting-rods and tailrods should be enclosed by sheet metal or mesh fabric in such a way as to prevent accidental contact with them, or they should be protected by a standard railing at least fifteen inches and not more than twenty inches from the moving parts. Any points of railings coming within fifteen inches of a moving part should be covered with sheet metal or mesh fabric.

In some instances oil shields are so arranged as to enclose these parts, making additional guards unnecessary.

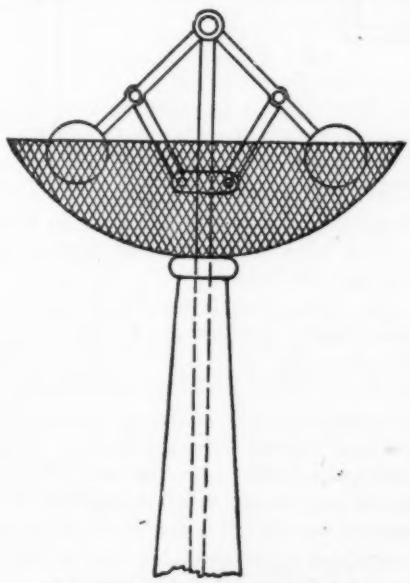


Fig. 1. Fly Ball Governor Guard

Care should be taken to guard all other revolving

or reciprocating parts or shearing motions where accidental contact may cause injury.

Main bearings which cannot be reached readily

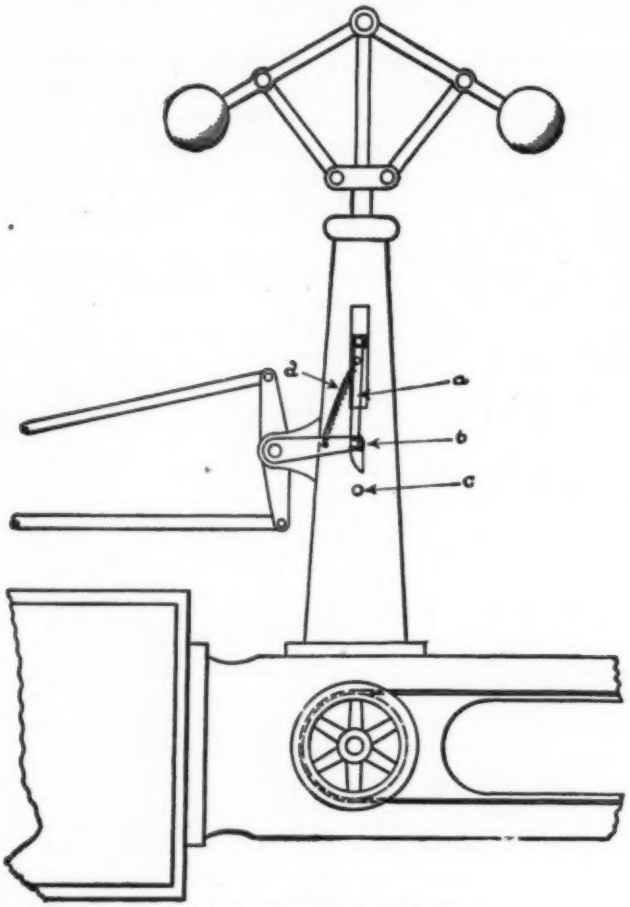


Fig. 2. Governor Safety Stop.

from the floor should be equipped with standard stairs having safety treads and railings on side opposite fly-wheel.

All ladders and stairs on engines should be railed and all staging six feet or more above the floor should have a railing with a toe-board at least four inches high at the base of the railing.

When the engine bed is used as a walk it should be equipped with a proper railing and toe-board.

Fly-Ball Governor Guard

A hemispherical sheet metal or wire-mesh basket strong enough to hold the balls in case of breakage, placed under the fly-balls, as shown in Figure 1, is a useful guard and is absolutely necessary if the governor encroaches at all upon a passageway or a position occupied by an attendant in the performance of his duties.

Access to Valves

Stairways or stationary iron ladders should provide access to valves—especially emergency valves—which cannot be reached from the floor or other safe place—provided, of course, provision is not made to operate the valve by remote control, from the floor or platform.

Oiling

The installation of automatic oiling systems has done much to prevent accidents in engine-rooms, besides effecting considerable economy in operation. Oil is regulated by gravity flow and the residue is caught in containers, and, after clarification, returned to feed tanks. Oilers' platforms and runways are installed in all up-to-date engine-rooms, and, if the oiler is properly instructed in his work and the safety rules of the plant are rigidly enforced, few accidents will occur.

The commonest form of accident in the engine-room is caused by the slipping or tripping hazard, and the careless handling of oil is one of the chief contributing causes.

Some Simple Governor Stops

Engines not equipped with proper safety-stops by the builder should be supplied with one of the following devices:

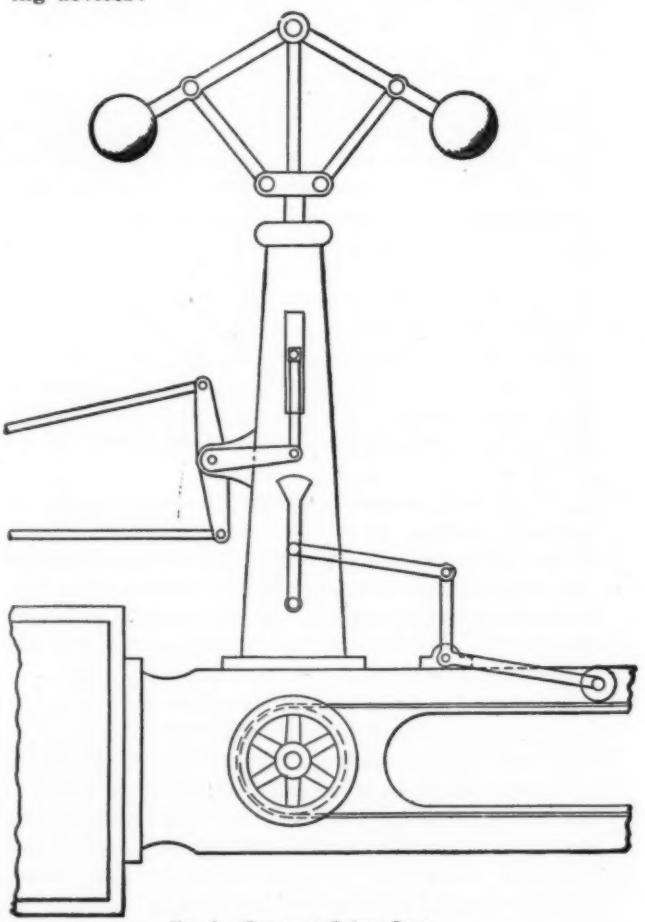


Fig. 3. Governor Safety Stop.

Fig. 2 illustrates a very satisfactory device. The end of the governor-rod "a" is formed into a hook "b" and hinged at the top to permit side action. If

the governor ceases to perform its function because of the breaking of connections between it and the engine, the balls will drop, thus causing the governor-rod to strike the pin "c" below it as shown in the cut, and to throw it out of connection with the rocker-arm. The spring "d" will then come into action and throw the valves so as to shut off entirely the flow of steam.

The load on some engines will occasionally become so heavy that the governor will drop sufficiently low to bring into action the "governor-stop" placed there by the builder, and thus shut off the flow of steam and stop the engines. This leads some engineers to block up the governor by keeping in position the pin provided for the purpose. This is a dangerous practice and one likely to end in disaster sooner or later. To provide the effect of the pin and at the same time to allow the "breaking-safety" to act in case of necessity, the device shown in Figure 3 is suggested. The main feature is the idler running on the governor-belt, upon which it depends to hold the "pin" in position.

Fig. 4 shows a stop similar to Fig. 2 except that it is electrically operated. It may be connected with a speed-limit system and operated from any part of the factory.

The utmost vigilance should be exercised to keep the engine in good order and the "breading-safety" working properly. The safety of the flywheel depends upon keeping the engine within the predetermined speed limit.

Independent Safety-Stops

The failure of the regular safety-devices, placed on the engine by the builder, to prevent flywheel wrecks, has prompted the invention of special safety-stops and speed limit devices designed to act independently of and supplementary to the regular devices. These special devices undoubtedly lessen the chances of accident and their use is therefore to be encouraged. But it must be borne in mind that they cannot be implicitly relied upon. They consist of complicated mechanism which generally includes an electrical circuit. It is well to attach them to engines, but the vigilance of the attendants should not be relaxed one iota when they are attached.

Some Home-Made Safety-Stops

Figure 5 shows a home-made safety-stop. It will make for safety in small factories where the engineer has duties to perform which necessitate his absence from the engine-room. The device consists of an ordinary gate-valve having a stem worked by a lever instead of a screw.

This valve is placed on the steam-pipe between the throttle-valve and the main stop-valve in the boiler-room. Referring to the figure, it will be observed that the valve is in an inverted position and is equipped with a long lever. To the end of this lever, which is nearly three feet long so as to make it easy to shut the valve, are fastened lines running to the different rooms in the factory. These lines are preferably of flexible wire rope or good window cord, and are guided by small ground-wheels so as to run easily in any direction. The lines are fastened to the end of the lever by means of a ring, another being fastened to the other end of each line. When the

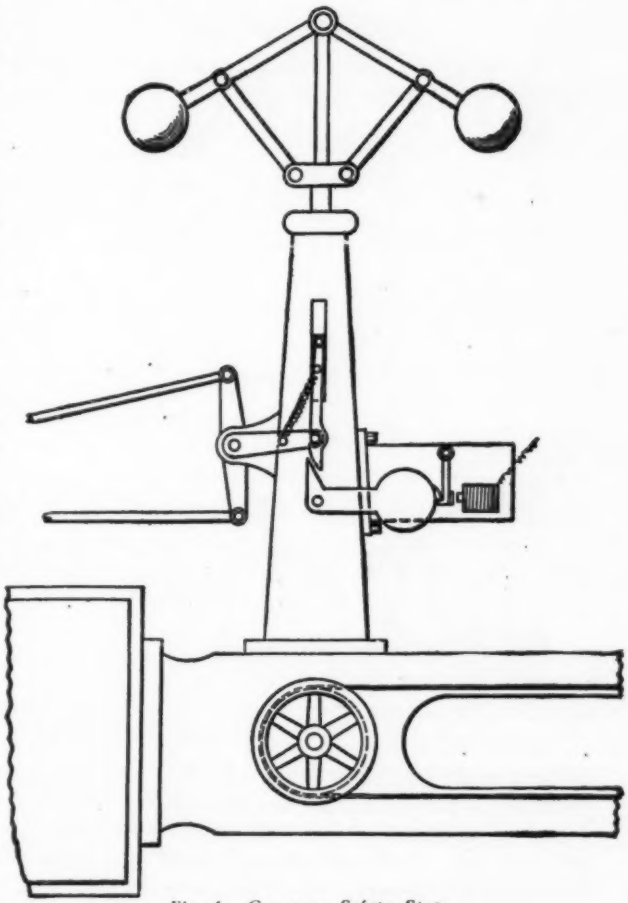


Fig. 4. Governor Safety Stop.

line is pulled down to shut the valve the ring is slipped on to a hook on the wall, so placed that it will hold the line taut.

Figure 6 shows an emergency valve patented, or a "simplicity engine-stop." This valve can be closed instantly and positively by a pull on the chain which hangs within easy reach of the engineer, usually at one side of or remote from the flywheel. If an engine is disabled, or starts to run away, anyone in the engine-room may cut off the steam quickly by a pull on the chain.

Automatic Vacuum-Breakers

When condensing engines are liable to be lightly loaded for any length of time, it is especially desirable to provide a safety-device that will break the vacuum when the water rises to a certain height in the con-

denser. If this is not done, the condenser may be flooded and the engine wrecked, should the speed of the air-pump slacken.

Safety-devices arranged to shut off steam in case the engine starts to "race" should also be arranged to break the vacuum at the same time. Even when the steam is shut off, the vacuum is often sufficient to speed up an engine under no load to the point where the wheel is burst by centrifugal force.

Steam Separators

It is important from the standpoint of economy that an engine have dry steam. It is further important that no water shall get into the engine-cylinder, as the clearances are small and a very little water getting in may result in a cylinder-head being knocked out. It is always advisable therefore to have a steam separator on the engine supply-pipe, placed as close to the engine-throttle as possible. The most useful separators are those of the receiver-type, that is, having a large volume, preferably six to seven times the volume of the engine-cylinder. Those receivers should be riveted steel-drums. A separator of the receiver-type is not only of value in interpreting the moisture in the steam, but also in maintaining an even flow of steam and in providing a reservoir close to the engine, by this means taking up the vibrations due to the sudden stoppage of the flow of steam when the engine-valves close, and preventing these vibrations being transmitted to the piping system. Steam flows in an engine supply-pipe at a velocity of from 5,000 to 6,000 feet a minute, and the alternate starting and stopping of the flow several hundred times a minute is very apt to set up serious vibrations. A separator is also valuable in catching bolts, nuts, etc., carelessly left in the steam-pipes in erecting new work, and thus saving engines and turbines from damage.

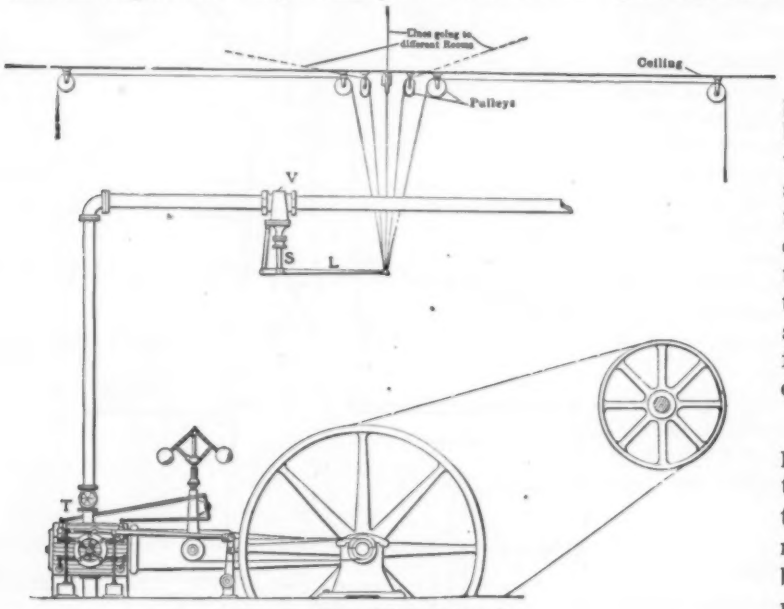


Fig. 5. Home-Made Safety Stop.

Separators are often so badly neglected that they are a menace, rather than a safeguard, to the engine. Usually the separator is connected with a trap which is intended to drain it automatically, but which is often out of order. All steam separators should be covered with some good insulating material. A separator presents as much surface as a considerable length of steampipe, yet it is not uncommon to find separators bare. Gauge-glasses on separators should be considered as important as those on the boilers, yet they are often broken or missing.

Engine Piping and Drains

The ends of cylinder or exhaust-pipe drains should be where they can be seen and where they cannot get a water seal. The exhaust-pipe drains should not be less than one-quarter the diameter of the exhaust-pipe. In condensing practice, care should be taken that these pipes do not connect to the condenser or exhaust-pipe at such a place as will make it possible for water to be drawn into the cylinder.

The practice of bringing the drain-pipes from both ends of the cylinder to a tee is dangerous. The reason is that the water forced out of one end may not drop down the tee-connection but be carried by, and up the other pipe into the cylinder in front of the advancing piston.

All steam engines should be equipped with explosion-diaphragms or relief-valves. Pop-valves should be placed on receivers of compound engines to prevent a dangerous rise of pressure due to the high-pressure, valve-stem breaking or other cause. The admission of high-pressure steam to the low-pressure cylinder has been the cause of a "racing" of an engine, and an explosion of its flywheel by centrifugal force.

A trap or other means should be provided to remove condensation from the receiver or cross-pipe of a compound engine, and it should be blown out each day in order to be sure that there is a clear passage through it.

Piping in General

Steam-pipes should always be of wrought-iron or steel. Cast-iron should never be used for this purpose. The use of copper pipe is also inadvisable.

"Full-weight standard" pipe should be used for pressures up to 125 pounds, and "full-weight extra heavy" pipe for pressures above 125 pounds. Cast-iron "standard" fittings should be used only for pres-

sures below 100 pounds, "medium extra heavy" for pressures from 100 pounds to 150 pounds, and "extra heavy" over 150 pounds. Malleable-iron fittings are better than cast-iron fittings, and cast-steel fittings are better yet.

Steel-pipe bends of long radius are preferable to cast elbows of short radius, as they give the piping system greater flexibility and so enable the expansions and contractions to be borne better, besides which they lessen the vibrations and make the steam-flow easier. It is always best for steam-piping to turn corners by long and gentle curves, avoiding right angles if possible. The pitch of all pipes should be in the direction of the steam-travel.

In making pipe-joints, screwed or threaded joints are suitable only for small pipes and low pressures. For pressures over 150 pounds, joints in pipes less than five inches in diameter may be of the screwed type if the end of the pipe is peened or rolled into a recess in the face of the flange, to prevent leakage and loosening of the pipe in the flange, but joints in pipes of over five inches had best be of the welded type or the Van Stone type, that is, having the ends of the pipe turned or rolled over the flange. In the Van Stone type of joint, rolled-steel flanges are preferable to cast-iron or cast-steel flanges. The flanges are loose and slip around on the pipe, which is a great convenience in matching bolt-holes in erecting. All flange-bolts should be long enough to have full threads in the nuts.

Gate-valves are preferable as a rule to globe-valves. Large valves, that is, over 6-inch, should be provided with by-passes. These by-passes will enable the valves to be opened easily by equalizing the pressure on the two sides, will enable steam to be admitted gradually to the cold end of the line and warm it up gradually, thus distributing the expansion stresses more uniformly, and will prevent water-hammer.

All pockets and dead ends should be supplied with drip-pipes so that all condensation can be taken care of. Do not allow any dead lengths of pipe to stand over night with the steam on them, if it can be avoided.

Wherever there is a rise in the main, a drain should be tapped into the lowest point of the main just below the rise. The mains and all important branches should terminate in a drop-leg into which a drain is tapped.

Valves should be so located, if possible, that they cannot form water pockets when either open or closed.

Steam-pipes should be blown out at intervals, to clear them of any debris that may have accumulated in them.

All separators, steam-reservoirs, and drop-legs should be provided with gauge-glasses which should be kept in good working condition.

It is advisable to avoid long steam headers intermediate between boilers and engines. Direct connections are to be preferred from every standpoint. Steam headers have caused disastrous accidents.

Short and stiff pipes for connections between boilers and engines are also to be avoided. Some engines have enough movement on their beds to cause the breakage of elbows and tees in short and stiff pipe connections. Proper provision for more or less movement should be made. If the engine-room roof is too low to permit the proper disposition of piping, "dog houses" should be arranged so that proper piping may be put in.

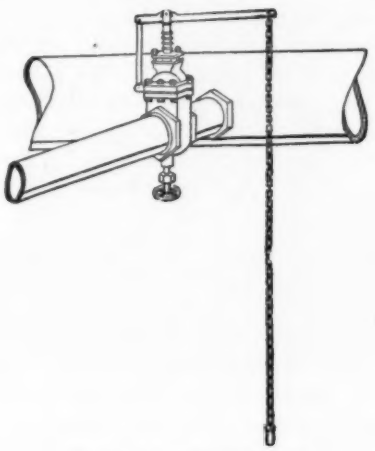


Fig. 6. Emergency Valve.

Engine-Room Rules

(a) Employes should be strictly forbidden to enter the engine-room, except for a special mission, and then should remain only as long as necessary.

(b) The engineer should not be permitted to leave the engine-room, until some other attendant who is thoroughly familiar with the engine, valves, and signals, is present to take charge.

(c) No person, other than those responsible for the operation of the engines should be allowed to touch any valves or other part of the mechanism, or approach any moving part.

(d) No one except the attendants should be permitted to go inside the railings or upon footways, when the machinery is in motion.

(e) The safe speed for each fly-wheel should be known, and in no case should this be exceeded. Fly-wheel revolutions should be recorded every day, in order to make sure that the engine is not running over the speed limit.

(f) All parts of engines and accessories should be frequently and thoroughly inspected, and daily tests should be made of the governor mechanism and automatic engine stops.

(g) Before getting into an engine or pump, be sure that the flywheel and crosshead are blocked, so that a leak of steam cannot start the engine.

(h) Be sure to place danger tag and lock on valves

before going into an engine or pump, or to work on machinery, and notify the engineer or operator.

(i) Under no circumstances should engines be started until they are thoroughly cleaned by alternately blowing live steam through each end of the cylinders, and the steam pipe and cylinders thoroughly drained of all water. The drip should be left open, until the load is put on, and then closed. Be sure to warm the engine at both ends.

(j) In shutting down, the drip valve should be left closed until the engine is stopped. If the throttle is equipped with a by-pass valve the throttle should be closed, and engine stopped with the by-pass. This gradually stops the engine, avoids the pumping effects of the piston and prevents water being drawn into the cylinder and cracks when compression occurs.

(k) Never attempt to "bar" a fly-wheel around off handed, nor pull it off center by grasping the belt, when the steam pressure is on.

(l) Never start to take cylinder head off or piston out of cylinder without making sure that the throttle and exhaust valves are shut tight and locked and the drains wide open; nor without trying the indicator cocks to see whether there is any pressure on.

(m) Never stop the air pump before stopping the engine (condensing), as the condenser and exhaust pipe may be flooded and overflow into the cylinder.

(n) All steam traps should be kept clean and in working order. Should a trap get out of order, and it is impossible to repair it at once, the by-pass should be opened sufficiently to pass off all water which might collect.

(o) Leaks in pipes, flanges or gaskets should be repaired at the earliest possible time.

(p) In opening up a cold line, all available drips should be opened. The line should be warmed by opening the by-pass where possible, or by opening the stop valve sufficiently to warm very slowly. Never open the main valve, until certain that the line is thoroughly heated. An inexperienced attendant should not be allowed to turn steam into a cold line, until properly instructed.

(q) Automatic valves should be frequently examined to insure their proper action in emergency.

(r) Under no circumstances should vacuum-breakers, governors, engine stops or other safety devices be blocked, or otherwise made ineffective. If such apparatus is out of order it should be repaired at once.

(s) Do not stand in front of cylinder head of engines.

(t) Do not place any material, tools, etc., on platforms or stairs around engine. They might fall off and injure someone below.

(u) Never work in a gas-engine room alone; always have a helper with you.

(v) If you find a man overcome with gas, get him into the open air at once, send for the doctor and notify the foreman.

(w) Smoking and open lights should be forbidden around gas machinery and gas pipes; otherwise an explosion might occur.

The Glarimeter, an Instrument for Measuring the Finish of Paper

By L. R. INGERSOLL
Associate Professor of Physics, University of Wisconsin

IT has, for some time, been possible for the paper maker to run control tests on most of the important properties of his product. Instruments have been developed and have come into general use for the exact determination of basis weight, strength, moisture content, etc. The same is not true, however, of the important quality of gloss or degree of finish, for the determination of this has been heretofore more or less a matter of guesswork. It is true that experienced paper makers have acquired skill in estimating and comparing finishes, but, lacking a standard of measurement, the scale of such estimation is bound to vary greatly with the individual.

It was this consideration which led the writer, a number of years ago, to develop* for the Forest Products Laboratory an instrument for the exact measurement of gloss. This was called a "Glarimeter" since it measured gloss in terms of the "glare" or specularly reflected light from the paper. It depends in principle on the fact that a sheet of highly finished paper polarizes the light reflected from it at an oblique angle in much the same way as does a surface of glass, but not so completely, the fraction of the reflected light polarized in this fashion is found to be a very satisfactory measurement of the gloss.†

The original instrument, while moderately successful, was never put on the market—partly because of the difficulty in getting the necessary optical parts

*See Electrical World, 63, p. 645 (March 21, 1914).

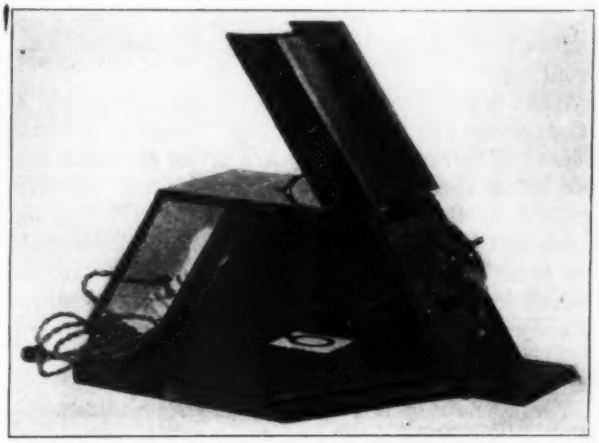
†The same conclusion has (apparently independently) been reached by a German chemist, Dr. Paul Keiser, who describes a very similar instrument operating on the same principle in the Zeit. für Agnew. Chemie, 32, 1, p. 357 (Nov. 11, 1919).

during the war time. Some months ago, however, in casting about for a suitable substitute for some of the parts, it was found that a radical change in the optical system—the adoption of a modification of the so-called Pickering polarimeter—not only increased very greatly the sensibility and accuracy of the instrument, but made it possible to obtain the parts in this country. A few of these new instruments have accordingly been made up and have, in spite of the short time since their development, already proved their usefulness in a number of mills. The writer has recently visited a mill where four are kept in constant service in controlling the finish of the supercalendered output and have already made themselves practically indispensible. The short time (15 to 20 seconds) required to make readings and the fact that no experience is required on the part of the operator are among the points which appeal particularly to the practical paper maker.

The general appearance of the Glarimeter in its present form is illustrated in the figure, although certain features which add to the convenience and quickness of operation are not shown here. Measurements may be made in an ordinarily lighted room. On looking into the eyepiece the observer sees a field of view divided into two parts; the lever is turned until these two parts appear of equal brightness, when the gloss may be read directly from the scale. The case is designed with the view of rendering the instrument equally practical for use in the mill, laboratory or storeroom.

In addition to the above mentioned control service, another field of usefulness lies in the assistance it will render the paper user in specifying exactly the degree of finish he desires on any given sort of paper. While the paper maker may rightly feel that he already has enough specifications to comply with, and is not likely to look with enthusiasm on the advent of a new one, it is admittedly better to have specifications which are definite and concise and which can be followed with certainty, than an expression of wishes in the hazy uncertain terms now in use, which invite misunderstanding. Instead of ordering so many carloads of a certain type of paper with a "medium finish"—whatever that may mean—the large dealer may now specify a finish of, say, "33 degrees"; and the mill superintendent, by keeping his output running so that it tests between 32 and 34 —as is easily possible—insures a uniformity of product which is bound to please and satisfy the customer.

Certain other uses for the instrument may also be mentioned; it will prove useful in testing and grading photographic stock; it can be used to give point to legislation already suggested to limit the allowable gloss in schoolbook papers; it may help the printer in his choice of inks for certain purposes and it will assist in the development of improved book and magazine papers. While intended primarily for white or lightly tinted papers, it can also be used satisfactorily for colored stock when a piece of colored (red-tinted will serve in most cases) glass is inserted in the eyepiece. Nor is its use limited to papers, for the gloss of any non-metallic surface may be measured in this way. It is possible, indeed, that in a somewhat different form it might prove useful in connection with the finishing of fine furniture or automobiles.



The instrument will be placed on the market shortly.

A New American Clay for Loading Paper

A HIGHLY colloidal clay which exists in large deposits in the intermountain regions of the United States has been found by the U. S. Forest Products Laboratory to be valuable as a loading material for giving finish and printing qualities to book paper. When this clay is used in conjunction with English China clay, the retention of the English clay is materially increased, and the paper produced has a superior finish and appearance, and a more velvety feel. The admixture of this clay similarly improves the retention of other fillers, and is especially desirable with some which have a low retention.

The ability of the new clay to remain in suspension may make feasible the installation in paper mills of a central mixing plant, from which the loading material can be piped a considerable distance to the beaters, without danger of settling or clogging of the pipe lines, and with the assurance that the concentration will remain uniform. The properties and use of the new loading material are more fully described in a report which may be obtained from the laboratory on request.

Box Board Costs

By E. G. CLARKE
Assistant Comptroller, The Richardson Company

COST, broadly speaking, is the expense incurred in the purchase, manufacture and sale of a product, the process of which is connected with and related to the prime object of business, viz., profit.

What is profit in the manufacturing concern but a "Conversion and Handling Charge" made to the customer? Too many concerns are prone to ride along and sell at the competitive or market price, trusting probably to the "Ouija Board" that they are making goods as cheaply as their competitors. But they allow their competitors to make the price; for, if one doesn't know what an article costs him, how can he intelligently fix a selling price?

Organization

The keynote of a cost system is organization. A good organization means an efficient economic management. Such management breeds a cost system to know whether it (the management) is functioning properly. A cost system relies on records and as such records must be accurate the co-operation of all departments is necessary. Good results can be obtained only through the whole-hearted support of the executives.

There are a number of fundamental points, which go hand in hand with organization, and really will be the result of careful management in perfecting a cost system.

1. A chart of accounts should be drawn up, giving all of the liability and asset account numbers, as well as those for departmental expense and others, pertaining particularly to the cost accounting end. This chart will show the interlocking of the general books of accounts with the cost ledgers, and will be a great help in visualizing the entire system.

2. Standardization in the purchasing of raw materials, goods contracted for, to be of same quality as specified on order.

3. The standardization of formulae, i. e., for the same grade and caliper of board, to use the same grade and quality of raw materials per beater as has been done in previous runs.

4. Accuracy and care in the furnishing of stock to the beaters by rigid inspection.

Accounting for Raw Material

By far the largest factor in the cost of manufacturing box board is the raw material charge. In 1920, which was the period of highest prices for mixed papers, news, sulphite, etc., these raw materials comprised from two-thirds to four-fifths of the total cost. Even at present, these materials make up about one-half of the total, so I would say that accounting for the paper stock is of first consideration in the obtaining of accurate costs.

The Richardson Company decided back in 1916 that it must know as nearly as possible the cost of any run of board. Up to that time the amounts for labor, departmental expense and overhead were pretty well allocated for each run of board, but the same could not be said of the material end. To be sure we had a rough idea as to what stocks were furnished to the beaters and that was all.

Our first step was to carefully classify the kinds of raw materials we wished to carry, eliminating those which were rarely used. It follows that we dropped a number of specialty items, by which I mean, grades of board for which we had a call once or twice a year and then in small quantities. The purchasing department insisted upon stocks being up to specifications, which meant that a bale of mixed papers was to be all mixed papers and not three-fourths papers, one-eighth water and the remainder dead rats, etc.

The receiving department weighs, classifies and lists on receiving sheets each bale as it is taken in; such receiving sheet with its invoice attached is sent to the cost department and the invoice amount is entered in the stock book with freight added. We have long ago abandoned the inclusion of warehouse and handling charges with the costs of raw materials, for we think it necessary to know the average price of each grade of stock, f. o. b. our mill. When warehouse or handling cost is added, this average price is often inflated with the additional handling expense, and makes material costs of a previous period or year valueless when compared with the present market. One can always know what his handling charge is each month on a tonnage basis without merging it with the material value.

The price of any raw material is the average of the value of inventory at the beginning of the month plus the value of stocks received during the month. To cost any run during the month we estimate at the beginning of the month what the average price will be for that period, taking into consideration the amount of material on hand at the start of the month, and the probable amount to be bought, as well as the trend of the market. Our estimated prices are very close to what the actual averages are found to be for that month after the books are closed.

We created the position of beater inspector, whose duties are mostly of a clerical nature, his chief purpose being to report stock used in the beaters. Let us revert to the planning department for a moment. After an order is taken, the formula for beater furnish is made out in quadruplicate; the original re-

mains on file, the other copies being sent to the board superintendent; through the co-operation of the latter with the chemist these formulae have been standardized. They show a formula number, customer's order number, and number of pounds of each grade of stock for the top liner, back liner and filler furnish. It is possible that the board superintendent for some good reason may change the furnish as sent to him; in any event he sends back one of his beater furnishes or formulae so that the planning department will know if any corrections or changes have been made. The superintendent retains one of the remaining two copies and forwards the other (which acts as a notice to furnish stock) to the foreman in charge of the stockroom.

A stock clerk keeps a record by rooms of materials on hand, received and disbursed to the beater room, his disbursement records being given him by the stock foreman. When the previous run of board has consumed all of the stock in the beater chests the beater foreman orders the next run to be furnished. The formula which was used by the stock foreman to furnish materials to the beater room is passed on to the beater inspector. The stock is weighed before going into the beaters, and the inspector keeps a record on the top, back and filler beaters separately; for example, his top liner sheet shows the date, formula number, board order number, inspector's name, and then gives the amount of each grade of stock furnished, each beater being ruled off separately.

Every time a new formula is used another set of top, back and filler sheets is made out (as you probably know a sheet of box board is built up of a top ply or layer, back ply and a cheaper filler, or inner ply). These sheets are sent up to the cost department as soon as the furnish is completed. Should the run be completed during the night, the office receives such sheets early the next morning. Here the reports of furnish are added, checked and entered on cost sheet (material cost summary), on which the cost of the liners and filler are kept separate.

From the machine room inspector comes the machine production report, giving the kind of board, formula number of run, caliper, test, per cent of moisture, size of sheets or rolls, customer's name and order number, pounds made and the total time of run, as well as lost time. Accurate inspection is obtained as to the percentage of moisture in board by taking square feet samples and weighing before and after drying. These samples are cut at regular intervals during the run. The scope of inspection of finished board comprises calipering, obtaining percentage of moisture, Mullen test, average speed as well as examination in regard to finish and quality.

Labor, Burden and Machine Charges

The material cost is shown separately from productive labor, burden and machine charges. These three latter charges (as far as the Richardson Company is concerned) are based on the productive hours, that is, total time of run less lost time. This means a productive hour cost is obtained for each.

Productive labor comprises all machine and beater room wages.

Burden includes superintendent's salary, taxes, liability and fire insurance, power, light and heat, depreciation and interest on buildings and equipment other than productive machinery, supplies and wages for repairs and upkeep on the aforementioned buildings and equipment, receiving and shipping expense and a portion of administrative expense.

Machine cost is a total of depreciation interest and repairs on productive machinery, meaning the reproductive or cost value of paper machine and its beater and jordon group, as a basis on which per cents of depreciation and interest are figured.

Having operated our present system for over four years, we can accurately estimate what the cost per hour will be for labor, burden and machine charges. The three with the material cost comprise our total cost f. o. b. cars.

It is evident that the two important variables are material and time taken to make board on the paper machine. The material furnish will vary, depending upon whether the board is plain chip or patent coated. While the hour cost on the board machine is the same for any one month, the resulting ton cost of board processed on this machine depends entirely upon the speed (and consequently the tonnage) with which this board is run over the machine.

At the end of every closing period, the amount of material used (as shown on cost sheets) is checked with the stock clerk's disbursement of materials into the beater room, an inventory, of course, being taken of stock on hand at the end of the month in the beater room. Almost every month gives a pretty close check, and **we are prepared to say any time during the month whether we are selling board at a profit.** If in dull times we feel obliged to take orders at less than cost we can judge just how far below cost we can go before the total loss exceeds the overhead or fixed charges. By this I mean, it is possible for purposes of keeping the organization together to run part time and absorb a certain amount of overhead. However, should orders be taken at too low a cost, it is evident that the loss on raw materials in the board made will more than offset the gain in running at least part time, the purpose of the latter being to absorb certain fixed expenses such as depreciation, executive salaries, taxes, and so on.

After four years I believe it would be impossible to have any of our executives abandon the cost system. We do not claim to have perfected ours; there is still much to do, but we do know we have reached the point where our system, imperfect as it may be, **has given us information which has paid for the cost of installing and maintaining it many times over.**

Power Plant Management

Ash and Coal Handling Equipment—Part IV

By ROBERT JUNE, M. E.

IF there arises in the mind of any reader of these articles on Ash and Coal Handling Equipment a question as to why we have paid such detailed attention to the matter of the selection of economical systems of handling, let us say at once that it is easily the most difficult problem confronting the power plant operator. On no other question is it so easy to make a costly and almost irremediable mistake. Nowhere is it harder to be dogmatic in assertion regarding the merits of any particular system for a given set of power plant conditions.

With a dozen possible systems to choose from, each costing from a few thousands to tens of thousands of dollars, depending upon the size of the plant, and each strenuously advocated by earnest sales engineers, the power plant operator may be excused if he throws up his hands in despair. The situation is not made easier by the practical necessity which he is under to make a choice. The increased cost of labor and coal, together with the uncertainty regarding deliveries of the latter, have made imperative adequate coal storage and economy in the cost of handling coal from the time it reaches the power plant yard to its final disposition in the form of ashes.

In our previous articles we have discussed the applications and limitations of various types of chain and belt conveyors, telphers and skip hoists. We have indicated the desirability of separating the coal and ash handling systems, but have yet to examine two of the most important systems of ash disposal —the vacuum and steam jet systems.

Vacuum Conveyors

In the vacuum conveyor a line of hard cast iron pipe is extended from the ash pit, or if there is no ash pit, from a point under the boiler room floor, immediately in front of the furnace, to an air-tight ash storage tank. Vacuum is established in the storage tank by motor or steam turbine drive centrifugal exhauster. An air washer is installed between the storage tank and the exhauster to remove ash dust from the expelled air.

When the exhauster is in operation, a current of air moving at very high velocity is produced in the pipe, through an intake port at the end of the line. Ashes, when introduced, are whisked through the pipe and into the storage tank.

The advantages of this system are:

1. FLEXIBILITY—The pipe can be carried in any direction, up or down, right or left, with discharge point a considerable distance from boiler room.

2. ADAPTABILITY—Easily installed in all types of boiler rooms, old or new.

The disadvantages are:

1. LIMITATIONS OF SERVICE—Ashes can only be removed from one furnace at a time, as the opening of an intake near the tank will destroy the velocity at an intake farther away. Only about 2,500 to 3,500 horsepower of boilers can be served by a single system—above that horsepower additional complete systems must be installed.

2. LEAKAGE—Both pipe line and tank must be maintained in an air-tight condition at all times.

3. EXPLOSIONS—There is danger of explosion of ash dust and gases in the storage tank. The introduction of water into the pipe line has been tried in an effort to overcome this, but the success of such means is doubtful, since a sufficient quantity of water to quench the ashes thoroughly will probably prove enough to choke the pipe with wet ashes. Water will also cause trouble by freezing the ashes in the tank in cold weather, and packing them so that their removal is difficult in other seasons.

4. MAINTENANCE—As in all ash removal systems, except the skip hoist, maintenance is high on account of the abrasive character of the ashes. Pipe renewals, especially bends, can be expected after 6,000 to 8,000 tons of ashes have been handled. Exhaustive repairs, especially to the impeller blades, are to be expected, due to some ash dust coming through the air washer.

Steam Jet Conveyor

Like the vacuum conveyor, the steam jet conveyor consists primarily of a pipe line into which the ashes are fed, and through which they are transported to a discharge point. The similarity between the two systems is not great, however. In the vacuum conveyor the ashes are moved by suction through the entire length of the pipe line, while in the steam jet conveyor, suction is employed only in what is called the suction line, immediately in front of the boilers or ash pits.

Suction is created by the action of high velocity live steam discarded into the center of the pipe line, in the direction of travel of the ashes. The steam discharge tends to create a vacuum behind it, which in turn creates a current of air through the air intake at the end of the line, similar to the action of the vacuum conveyor. The effective suction distance of one steam jet is, of course, limited, and if this distance is exceeded it is necessary to install additional

booster jets. The discharge of the ashes beyond the steam jet is really an ejection, due to the force of the jet actually pushing the ashes through the pipe. Hence, the effective discharge distance of a steam unit is much greater than its suction distance. There-

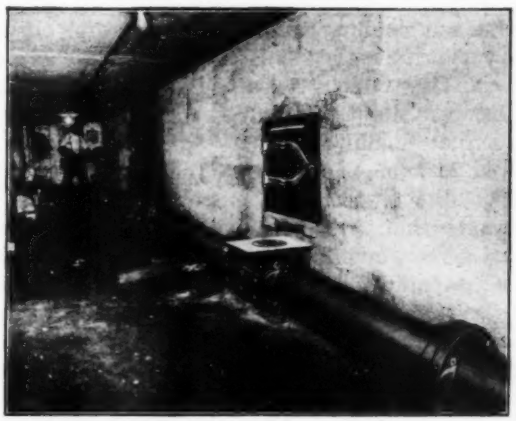


Fig. 1. Steam Jet Conveyor Installed Below Ash Pit.

fore, in the average system, no additional steam jets are necessary in the discharge line.

The advantages of the steam jet conveyor are:

1. FLEXIBILITY—Pipe can be carried in any direction. Any type of discharge may be used, as, for instance:

(a) Where it is desired to fill a gully or other low ground the ashes are merely blown from the end of the pipe without any restraint. As the ashes are blown 50 to 75 feet beyond the end of the pipe, some ash dust will be carried over the neighborhood, even where the most effective water jet is installed in the line.

(b) For loading cars, wagons, etc., a baffle box may be used. Some trouble due to dust may be anticipated with this system, but if properly designed, the dust may be so minimized as not to be objectionable in manufacturing districts.

(c) Where no ash storage bin is desired, the most careful attention must be paid to design, so that no dust will be discharged with the exhaust steam; no trouble will be caused by water of condensation; no water will be allowed to come in direct contact with the ashes in the bin; ashes will be discharged into the bin without any remaining downward component of the conveying force which will cause packing; impact of the incoming ashes must be taken by a suitable baffle as ashes discharged against the bin walls will soon cut holes through them.

2. ADAPTABILITY—Can be installed in practically any plant no matter how crowded.

3. LOW INITIAL COST—Owing to simplicity and freedom from mechanism, this is probably the cheapest effective system, so far as first cost is concerned, which can be installed.

The disadvantages of the steam jet conveyor are:

1. CLINKERS—Clinkers must be broken to size to pass through intake opening. Under average conditions, burning run of mine bituminous coal, this is not a serious disadvantage, as clinkers can usually be easily broken with hoe. In cases, however, where the ash produced is made up almost entirely of large hard clinkers, steam jet conveyors should not be considered.

2. STEAM PRESSURE—Not less than 80 pounds pressure is required.

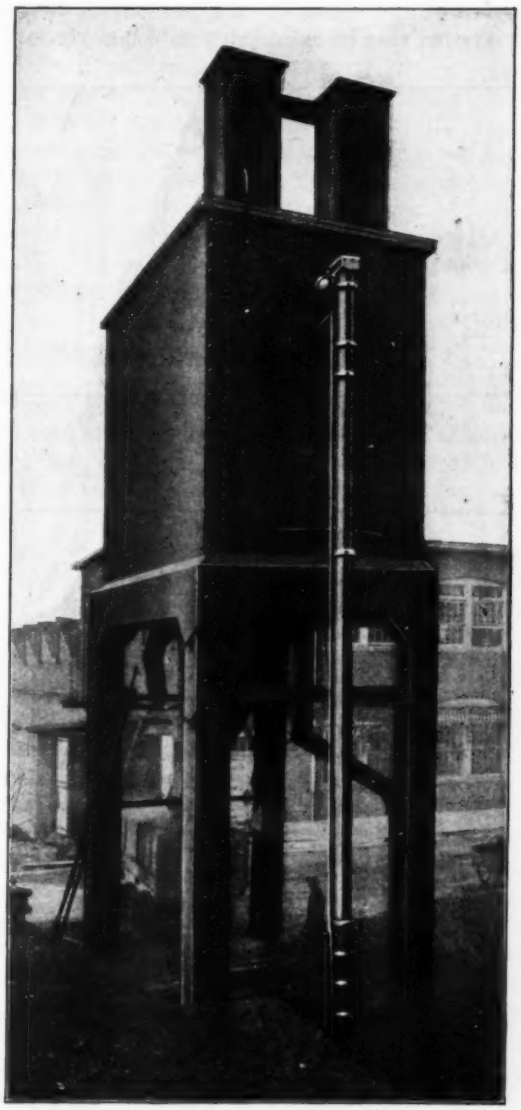


Fig. 2. Typical Steam Jet Conveyor Storage Bin.

3. WET ASHES—Generally speaking, wet ashes cannot be handled on account of packing at turns in the line; this eliminates certain types of installations, as, for instance, water-sealed gas producers.

4. LIMITED CAPACITY—Two thousand five hundred to 3,500 horsepower of boilers is about all which

can be handled by a single system; above that horsepower additional systems must be employed.

5. MAINTENANCE—The abrasive character of the ashes render pipe renewals, especially at bends, an expected occurrence after 6,000 to 8,000 tons of ashes have been handled. In order to cut down renewal expenses, elbows are made with removable backs, and, where possible, long sweep bends are employed.

6. ASH FREEZING—Ash freezing in storage tank is to be looked out for in cold weather.

An idea of steam cost for a typical steam jet conveyor system may be obtained from Table I.

TABLE I

Boiler No.	Distance from ejector	Steam pressure	Quantity of ashes removed	Time	Tons per hour	Pounds steam used per minute	Steam used per ton ashes removed	Cost of steam per ton ashesmoved
1.....	4′	110	300 lbs.	1′0″	9.00	37.43	349.3	$0.068
2.....	19′	109	292 lbs.	1′0″	8.79	37.10	253.2	.07
3.....	35′	109	284 lbs.	1′0″	8.46	37.10	274.9	.078
4.....	52′	108	234 lbs.	1′0″	7.04	36.85	314.0	.088
5.....	64′	109	210 lbs.	1′0″	6.30	37.10	353.3	.098
Av....	34′-8″	109	264 lbs.	1′0″	7.92	37.10	289.0	$0.080

Reginald Trautschold is authority for the following table of annual operating costs:

TABLE II
Annual Operating Costs in Dollars per Ton-Mile

Equipment	Fixed charges	Operating expenses	Power expenses
Flight conveyors (including 20% elevation)	17.5/N	0.55	5.30 Pc
Belt conveyors (including 20% elevation)	109.5/N	0.15	2.15 Pc
Pivoted bucket carriers (including 33⅓% elevation)	520.0/N	0.40	2.65 Pc

N equals hours per year equipment is in operation.
Pc equals cost of power per horsepower.

As indicative of the labor saving effected by a conveyor of this type, one user reports the elimination of 1 ash wheeler, 1 teamster and 1 horse, at a saving of $12 per day. Conditions are described as follows:

"The only expense for maintenance, after six months' constant operation was the replacement of the first section beyond the steam nozzle, which was completely worn out. The conveyor handles the ashes from a battery of five (5) 150-horsepower boilers, and one 500-horsepower boiler. The coal used is a fine, dirty slack stored on the open prairie, and containing, owing to the inclusion of mining machine dirt, about 25 per cent of ash. The ashes are left on boiler room floor in front of boiler until cleaning is completed and are then put into conveyor, which handles the complete cleaning in about seven (7) minutes. The grade of conveyor pipe line rises about 8 per cent for 200 feet, then 45 per cent for about 40 feet, discharging onto an open pile."

Determining Class of Equipment to Be Installed by Calculation

We have now discussed all the important types of coal and ash handling equipment. Regarding our ash conveyor questions as disposed of, let us give a final glance at the problem of making an intelligent selection between flight, pivoted bucket and belt conveyors for coal handling.

As an example of methods of determining, by calculation, the type of equipment to be installed, let us assume that a power plant requires 40,000 tons of coal a year, and that the distance from the track hopper or point of delivery to the far end of the conveyor system is 440 feet, we have thus 3,333 ton-miles per year. Let us also assume that when in operation the conveyor system must handle 80 tons per hour.

We know that the initial cost of the belt conveyor will be considerably heavier than that of the flight conveyor, but our choice will be governed by consideration of costs per ton moved as well as initial costs.

Sample Calculations

(a) Flight Conveyor system: 40,000 tons annually.
440 ft. 80 tons per hr.
Power cost, 2c per hp.
Hours of operation $\frac{40,000}{80}$ equals 500 hr. per year.
Annual cost: Refer to Table II.

$3{,}333 \times \frac{17.5}{500} = 116.65$
$0.55 \times 3{,}333 = 1{,}833.15$
$5.30 \times 3{,}333 \times .02 = 353.30$

Total.....$2,303.10 or 5.76 per ton.

(b) Belt Conveyors: Same conditions as (a)
Annual cost:

$3{,}333 \times \frac{109.5}{500} = 729.93$
$0.15 \times 3{,}333 = 499.95$
$2.15 \times 3{,}333 \times .02 = 153.31$

Total.....$1,403.19 or 3.66c per ton.

(c) Pivoted Bucket Carrier: Same conditions as (a), except length, which is 220 ft. Service 1,667 ton-miles per year.
Annual cost:

$1{,}667 \times \frac{520}{500} = 1{,}733.67$
$0.40 \times 1{,}667 = 666.70$
$2.65 \times 1{,}667 \times .02 = 88.35$

Total.....$2,488.72 or 6.22c per ton.

The foregoing examples are, of course, merely illustrative of the principles of calculation. If conditions were changed, the results would not be the same, relatively, nor do such figures alone tell the story, since it must be remembered that the pivoted bucket carrier could be used for ash handling as well. The one rule then is to take a given set of plant conditions and to work out the actual costs of installation and operation for each of all the various types of conveyor which might be installed. Only through thorough investigation can the proper equipment for any plant be chosen.

Notes on Bleach and Bleaching

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Address Before the Michigan Division of the Pulp and Paper Mill Superintendents' Association, January 20, 1921, at Kalamazoo, Mich.

IT is my intention to submit a few notes on bleach and bleaching, dealing with the subject in a general way with a few specific examples, without attempting to go into the chemistry of the subject too deeply.

The pulp used in the manufacture of light colored papers, whether one of the wood pulps, or the rag pulp, has to be bleached to increase the value of the product. It is comparatively simple to bleach the coloring matter in rags, compared to bleaching the lignin incrusting materials and substances of a complex nature formed in wood pulp. The wood pulp requires a more drastic treatment, requiring a greater amount of bleach which produces a greater proportional loss.

The object of bleaching is to obtain a material of a permanent maximum whiteness. There are several bleaching agents, many of which have been used to a greater or less extent at some time in the process of bleaching paper making materials. Chlorine, or some of its compounds has met with the greatest success, and has been the most generally accepted. This agent will be the only one discussed in this paper.

It is well to review a little of the history of the development in the use of chlorine as a bleaching agent. Chlorine does not occur free in nature, but was discovered by Scheele in 1774. It was first applied to bleaching by Berthollet in 1785, who used chlorine in water. An attempt was made to use it in the paper industry by generating the gas from manganese dioxide and salt, by allowing sulphuric acid to react with it in an earthen jar, and absorbing the gas in water. Chlorine in water forms a very unstable solution, and due to the lack of knowledge in handling it, and with the crude apparatus used, this process did not meet with much favor.

In 1798, Tennant patented a liquid bleach. This was manufactured by passing the gas into a solution of caustic soda, or milk of lime. As a bleaching agent this was a success, but there was the inconvenience of shipping a weak solution to be overcome. In the next year, Tennant introduced the improvement of manufacturing a solid bleaching agent by passing the chlorine gas over slaked lime forming calcium hypochlorite, which is commonly called bleaching powder.

During the winter months, the household linens invariably get yellowed as they are dried indoors after washing, but with the coming of the bright days of Spring when the pieces can be hung out to dry, they are oxidized by the sun and air, back to a pure white. Similarly, the bleaching of paper pulps is a process of oxidization. When bleaching powder is mixed with water, hypochlorous acid is formed. In the molecule of acid the oxygen atom is very loosely held, and when in the presence of oxidizable matter—the acid is reduced, and the substance oxidized to a higher state. It is not the chlorine as chlorine that does the bleaching, but the oxygen formed.

The general practice in the manufacture of chlorine is to use the electrolytic cell, of which there are several successful types. The principle is usually the same, that of breaking up a solution of common salt by an electric current. The products being hydrogen, chlorine and caustic. The particular chlorine product obtained depends on how the gas is handled after it comes from the cell. It may be compressed as a gas, absorbed in a lime, or a caustic solution, or absorbed by hydrated lime forming a solid bleach.

As the products from these three methods are all bleaching agents used in our industry, they will be considered separately. The solid bleach was the first generally accepted, and has been the most used—therefore will be considered first.

Bleaching Powder

This bleach is prepared by passing the chlorine gas from the cell into a cool tight chamber usually 6½′ high. The gas is absorbed by hydrated lime spread on the floor in a layer from 2″ to 4″ deep. The lime is usually furrowed to expose the largest possible surface to absorb the gas. When the action is complete the gas is shut off, and in time the chamber opened and the bleach shoveled into drums.

Mills buying this type of bleach should specify the minimum amount of available chlorine to be accepted —usually 35% available chlorine is considered a minimum. It is sometimes advisable to contract for monthly deliveries on bleaching powder. When this does not seem feasible, but a small stock should be carried on hand. The bleach as received at the mill is usually in steel drums or oak casks. These should be stored in a cool dry place so the powder will retain its strength and be less active on the drum. The drums that are the oldest or any that have been injured in handling at the mill should be used first.

In preparing the bleach for use, it is the general mill practice to mix the powder with water, but there are some mills that use it dry. This is very poor practice for free lime in bleaching power is a condition of its stability. For this reason the presence of free lime in the liquor retards the reaction of bleaching. Also there is always the insoluble matter in the lime that is carried into the half stock under these conditions. In one instance a saving of nine pounds

of bleach per washer was made in mixing the bleach with water instead of using the dry powder.

In the mixing of bleach, a very good system consists of four tanks: two tanks for mixing, one for standardizing the solution, and a storage tank. The powder is dumped into the first mixing tank, and agitated until all lumps are broken up with less than the required amount of water to bring it to strength. The time of agitating should not require more than a half hour; with longer stirring the solution clears slowly. After settling, the clear liquor is drawn over into the standardizing tank and the sludge washed with fresh water. Part of this water is used to bring the solution in the standardizing tank to the proper strength, and the remainder is run to the second mixing tank. This method varies with the mill, but usually with a little care, a system can be worked out to obtain a clear standard solution with a minimum waste in the sludge. This waste should run below .5 of 1% available chlorine.

The test of bleaching solutions is usually expressed by the hydrometer. This is better than no test at all, but does not indicate the percentage of chlorine or show any waste there may be in the sludge. Titrations with sodium thiosulphate, or arsenious acid give the available chlorine content and if no accommodations can be had at the mill for carrying these out, it would sometimes pay to have the solution and the sludge tested for available chlorine in a commercial laboratory.

Chlorine Gas

Having considered the solid bleach, I will next consider the chlorine gas. This might be divided into two divisions: gas manufactured at the mill, and gas shipped to the mill in cylinders weighing usually 100 to 150 pounds.

The latter method has been developed quite recently and depends on the controlling apparatus for its success. The gas for bleaching wood pulps is absorbed in a solution of milk of lime run through the controlling apparatus and to settling tanks. The advantages of this method are absolute control of the strength of the solution by metering the gas and doing the work with less equipment than is used in paper with electro bleach plants. Gas in water to the extent of about .5 of 1% may be used to bleach rags. This is not common practice in a mill generating their own gas, owing to the difficulty in handling and keeping the unstaple water solution. This is easily controlled by the special apparatus for this purpose. Shipping in cylinders saves storage space, deterioration, handling and freight.

Mills using large amounts of bleach which are situated near cheap electric power, and far away from a good bleach supply have found it profitable to manufacture their own chlorine. In these mills, it is common practice to absorb the gas in milk of lime which is run against a stream of gas in a tour employing the counter current principle. It may also be absorbed in a caustic solution instead of milk of lime, but the action of this type of bleach, although more staple, is a slower bleaching agent than the milk of lime. This solution is run through settling tanks and the solution on clearing is the same as that obtained in mixing bleach with water. It usually contains 2-3% gas. The mills using the electrolytic cell also have hydrogen and caustic from their plant. The hydrogen is many times wasted, but may be used in making acid, hydrogenating edible oils, etc. Some of the caustic may be used about the plant, but most of it is concentrated and put on the market.

Process of Bleaching

Having considered the chemical chlorine used in bleaching, a word should be said about the machinery in which the process is carried out. It is possible to bleach in any kind of a container where the material may be brought in contact with the bleach. However much attention has been paid to power consumption, through mixing, density of stock handled, labor required, and the development of a continuous process. Rags are quite commonly bleached right in the washers, and most of the improvements apply largely to other pulps. Bleaching has been carried out in chests equipped with or without agitators. The Hollander is frequently used as a Hollander, and with modifications. Some of the modifications have been—replacing the beater roll by a paddle wheel, dumping the stock into a tank and allowing it to come to color, sometimes using a stronger liquor, part of which is reclaimed, and used again, and allowing the bleach left in the stock to exhaust itself. Some of the successful intermittent types use a screw propeller on various shaped vats which may be lined with tile to reduce friction, or made of various materials. These types have been very successful, in handling concentrated stock with little labor, giving perfect circulation, economy of power, and almost unlimited capacity. Of the continuous processes that have been worked out, they most all consist of upright vats equipped with pumps or propellers that move the stock from one vat to the other or allow it to circulate in the same vat. The capacity depends on the number and size of the vats. What was said of the intermittent type applies to this type only in this—the vats are full all the time with a steady production of bleached pulp.

Rags and sulphite pulp may be considered to get a comparison in the different methods of bleaching.

In the bleaching of rags we have an easy bleaching stock, bleached cold without special equipment when carried out in the washer.

The rags properly cooked are fed into the washer and circulated with the roll up. When full, the cylinders are lowered and clean water run in at a rate equal to that of the dirty water being removed. It is essential to carry this washing far enough so that

the water coming from the cylinders is clean, that none of the dirt will have to be acted upon by the bleach. Near the completion of washing, the roll is lowered and the rags cut to the proper degree. This cutting is usually gauged to be completed during bleaching. The roll should not be lowered too soon reducing the rags too quickly, for this would increase the loss through the cylinders. The ultimate length the stock is left depends on how much further treatment the stock will receive before being made into paper. It should be of such a length that it will work nicely with the other stock, and not require enough treatment to hold up other processes. The consistency of the stock before bleaching should be as thick as possible and still circulate well. This consistency, which is usually 2 to 3% density, has to be regulated before raising the cylinder. The less water in the stock, the stronger the bleach will be in the washer. With the addition of bleach liquor at this point, the stuff is circulated until a satisfactory degree of bleaching is obtained. The stock is usually dropped to a drainer where it comes to a good color, the bleach left in the stock acting as a preservative, until it gradually exhausts itself. When the rags are dug from the drainers, they should be tested for bleach. This is easily done by using a starch iodine solution which gives a characteristic blue color in the presence of chlorine. It is best practice to apply indicator to the pulp rather than to the water drained from the pulp. The time of washing depends upon the condition the rags are in, coming to the washer.

The time of bleaching depends upon the condition of the stock, and the strength of the liquor. Many mills prefer a weak liquor with a longer time, while some like to decrease the time and use a strong bleach.

When the stock is to be used directly without going to the drainers, if it is impossible to allow the bleach to exhaust itself, an antichlor may be used or the process may be hurried with the use of an acid. The use of an antichlor is usually not recommended, as you are wasting bleach in this method.

In using an acid, the hypochlorous acid is liberated. It is only necessary to use a small amount of acid, and this should be diluted with several times its own volume of water. It should be added slowly at different intervals, and stopped if any strong odor of hypochlorous acid exists. After any lime salts that may be present are neutralized, a small amount of acid is as beneficial as a large amount, because with the liberation of hypochlorous acid, it is again reduced to forming more acid—once started, is continuous. Sulphuric and hydrochloric acids are commonly used, but acetic acid is less harsh and will produce equally good results. Acid is also sometimes used in just sufficient quantity to act as a clearing sour on the chemical deposits present, and produces a purer pulp.

There are several neutralizing agents, bleach killers, or antichlors. The ones most generally used are sodium hyposulphite and sodium sulphite. The latter forms neutral salts which have no effect on the machine wire while the hypo forms some acid, which may act on the wire. Whichever one is used, it should be handled so as to avoid excess. By using the indicator, starch iodine already spoken of, this can be regulated nicely.

Sulphite is an example of a hard bleaching stock, and will be considered as being bleached in a special bleacher. The stock is fed into the tile lined vat, and is circulated by a propeller situated in a housing outside the vat and connected to it with flanges. The vat holds 18 tons, or the dump of one digester. It requires about 3 hours to fill; the stock of a density of from 4 to 6% is about 70° Far. when it enters the vat and is heated up to 100° Far. in the process of bleaching. This addition of steam is usually customary with hard bleaching stocks to hasten the action of the bleach. A high density of the stock besides making the bleach stronger also saves on steam. However, the consumption of bleach is greater than in a cold process, and the steam should be handled very carefully or the chlorine will attack the cellulose, forming organic chlorides, causing the color to go back.

To sum up briefly I have tried to bring out that the first attempts to use chlorine gas as gas, or absorbed in milk of lime were unsuccessful, and that solid bleach was the successful bleaching agent for a long time. Now as development has been made, there is a tendency to manufacture the gas at the plant and more recently have it shipped to the plant in cylinders, to be used with a special controlling device.

I have also attempted to show by examples how bleaching is carried out on an easy bleaching stock, and a hard bleaching stock, a hot and cold process, the use of acid and antichlors, and as handled in the ordinary washer and as handled in a special equipment.

The Proper Handling of Belts

A Comment

I WAS interested in an article I have just read in the December issue of The Paper Industry, entitled, 'Stopping Belt Slip with Cutting Edges.'

"Without question exactly the effects which resulted from this practice in this particular case would occur in any case.

"This particular exaggerated instance of a common fallacy can perhaps be profitably used as a text for a further small sermon on this subject.

"There are a great many men associated with belts who, without thinking very deeply about the subject, gain the impression that belts slip because the pulleys are polished and in consequence are slippery,

and then very naturally arrive at the deduction that if those pulleys can be made rough of course the belis will not slip.

"The possibility of transmitting power by means of belts is due to the fact that the belt gets a more or less efficient grip on the face of the pulley, or expressed mechanically, the coefficient of friction between the belt and the pulley is suffiçient to enable the belt to transmit its load with a more or less degree of efficiency.

"This is only possible at all, however, because of the contact between the belt and the pulley. If the belt had little or no contact on the pulley it would transmit little or no power. Hence the more contact there is between the belt and the pulley a higher percentage of efficiency is secured. It is in part for this reason that slack belts are so much more efficient than tight belts (provided the belt can be kept from slipping), because the slack running belt has a very much greater area of pulley contact than a tight belt, wrapping in some cases 270 degrees of the pulley.

"But it is not only the percentage of the circumference of the pulley in contact with the belt, but also the intimacy of the contact of all parts of such belt surface with all parts of such pulley surface, and it is just here that the rough faced pulley man goes wrong. If a pulley is rough, the belt naturally rides on the high spots. Between these high spots there is a large area of pulley surface which the belt does not touch. The same thing is true if the belt is rough.

"In consequence the highest possible efficiency comes from the smoothest possible belt surface and the smoothest possible pulley surface, because it is only in this way that the maximum area of contact is secured.

"Many men follow the false lead of covering their pulleys with a rough lagging or of painting them with rough pulley paint. They are following the wrong road to a desired end. If the belt is kept in proper condition, so that it will not slip, then the smoothness of the pulley is a very great asset.

"And as against the idea of a rough pulley the slightest element of roughness tremendously increases the amount of heat produced by any slipping whatever, and that friction and heat are very destructive to the belt tissues.

"If therefore the belt is so treated that it will not slip and can be run slack, then the slacker it runs the more power it will develop, the longer it will last and the less trouble it will cause. W. D. Y."

Mechanical Standards

Report of Committee on Medical Standards of the Technical Section, Canadian Pulp and Paper Association *

Presented at the Annual Meeting on January 19, 1921, at Montreal, Canada

PREVIOUS to the annual meeting held in January, 1920, your Committee sent out a questionnaire covering various items on which the Committee on Mechanical Standards considered information should be obtained and tabulated. Nearly one year has passed since, and in spite of repeated requests, only a very small number of questionnaires have been received, hence it is very difficult to make a reliable tabulation from these questionnaires. Furthermore, even the questionnaires received give, to a very large extent, rather incomplete information, and your Committee is of the opinion that the majority of the mills have not fully realized the advantages that would be obtained from standardization of mechanical equipment.

Under the circumstances the Committee considers that it shall make no further endeavor to compile information in accordance with the standards adopted by the various plants, as apparently the co-operation anticipated is not forthcoming.

Your Committee has viewed various publications in connection with metal alloys used extensively in the industry, and has authorized the publication of a translation from the Italian Chemical Gazette of an article on "Special Bronzes—Lead Bronzes" by **F. Giolitti** and **M. Marantonio.** The subject of acid-resisting bronzes was further gone into, and in appendix "A" you will please find particulars as to the findings. Under "B" in the appendix you will also find various data collected regarding lead and antimony alloys. The subject of Bearing Metal is referred to under "C," but we believe that the information collected thereon is not conclusive, and we would suggest further investigation on this subject.

Your Committee has reviewed various publications in being able to report satisfactory data in connection with the flow resistance of paper stock in pipes. Although numerous tests have been made, on account of the presence of fibre, it has been impossible to keep the observing instruments clear when the consistency of stock was in excess of about 1 per cent. Your Committee has spent considerable time in trying to perfect a method which would eliminate this trouble, and believes that the problem has been practically solved by the application of compressed air to keep free of stock all orifices of the instrument used, but unfortunately tests could not be made since the adoption of this method. We hope, however, to

*The illustrations in this report are shown through the courtesy of Pulp and Paper Magazine of Canada.

be able to complete these observations at a later date, and when completed purpose to publish this information in the Pulp and Paper Magazine, and we hope it will meet with your approval.

Respectfully submitted,—J. Stadler, J. O. Mason, A. P. Costigane.

A—Report on Investigation of Acid Resisting Bronze

The present investigation covers the ordinary copper-tin-lead bronzes principally used in the chemical pulp industry.

In addition a few metal alloys, put on the market under various claims for strength and acid resisting qualities, have also been investigated.

An investigation of this nature naturally divides itself into the following parts: The physical properties of the alloy, and its acid resisting qualities.

The Mechanical Properties of Copper-Tin-Lead Bronze

The alloys used for the investigation had the following composition:

The Physical Properties of Copper-Tin-Lead Bronze

	FORMULA				ANALYSIS			
	Copper	Tin	Lead	Phosphorus	Copper	Tin	Lead	Phosphor
					Per Cent			
1	90	10	0	0.05	89.92	10.25	0	0.011
2	85	10	5	0.05	84.97	10.33	4.5	0.024
3	85	5	10	0.05	84.77	5.54	9.63	0.062
4	80	10	10	0.05	79.73	10.27	9.87	0.068
5	80	5	15	0.05	81.10	5.12	13.66	0.066
6	76	9	15	0.05	75.85	9.40	14.72	0.066
7	70	15	15	0.05	70.23	15.54	14.03	0.066
8	70	10	20	0.05	71.00	9.93	19.00	0.048

Three test pieces were made from each of these alloys, with the exception of lots 4 and 5, from which four pieces were made.

The results of the physical tests given below are accordingly the mean value of three and, in two cases, four tests.

The casting of the test pieces presented considerable difficulties and, in overcoming these difficulties, a great deal of useful information applicable to foundry practice was obtained.

In the report of the Mechanical Standards Committee, submitted to the previous meeting of the Technical Section, some preliminary figures were presented on the physical properties of copper-tin-lead bronzes.

These figures are very interesting in the light of the present investigation, and, in the following discussion of the results below, references will be made to these figures.

In addition to the physical tests made, the alloys were examined under the microscope for the purpose of examination of their crystaline structure.

These microphotographs, having a magnification of 100 times their diameters, reproduced in figures 1 to 9 inclusive.

An examination of the microphotographs shows that all the alloys were made of sound metal. No oxides, dross or porous spots are found in the castings. In other words, the foundry practice has been very good.

In examining Fig. 1 round black spots are noted. These spots consist of lead globules. The lead is present in this as an impurity. It should, however, be noted that the lead does not unite with the copper and tin. Rather it appears throughout the alloy—

Fig. 1. Copper 90, Tin 10.—Round black spots are due to trace of lead markings; dendritic structure—same composition as balance of the metal. Note the globular form of the lead, like oil drops. It will not dissolve in the other metals.

up to a certain percentage—as globules resembling oil drops.

Figures 2, 3, 4, 5 and 6 show the dissemination of the lead throughout alloy.

In all these mixtures the non-tendency of the lead

Fig. 2. Copper 85, Tin 10, Lead 5.—Shows oriented crystals, dark and light areas, dendritic forms well defined.

to unite with the copper and tin is clearly shown. The copper and tin, on the other hand, unite freely. As the proportion of lead increases, it shows the increasing tendency to separate into larger globules.

In Fig. 5, the lead has increased so that this metal begins to line out between the crystals. Finally, in Fig. 7, containing 15 per cent lead, a very bad segre-

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Fig. 3. Copper 85, Tin 5, Lead 10.—Black areas lead, no dross or porous spots, dendritic forms pronounced.

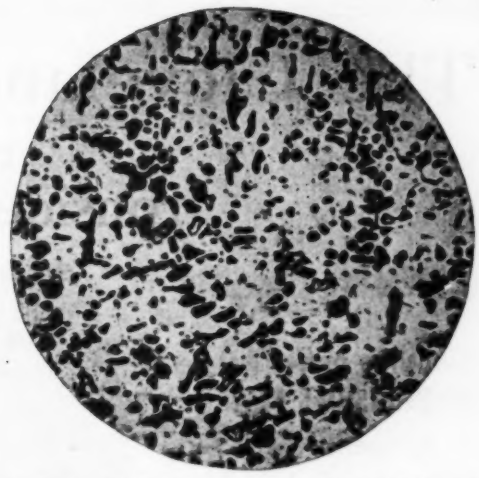

Fig. 6. Copper 76, Tin 9, Lead 15.—Lead dead black, and dendrites very dark and not to be confused with lead.

Fig. 4. Copper 80, Tin 10, Lead 10.—Dendritic form less marked than No. 3. Distribution of lead finer and more even.

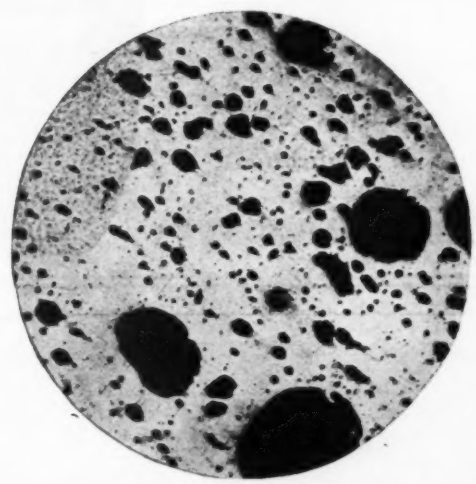

Fig. 7. Copper 70, Tin 15, Lead 15.—Note how lead has gathered into large globules. It is segregated badly (not shown by photograph). In light areas, with a glass, the network of copper-tin eutectic is plainly visible. This alloy was most resistant to etching solution.

Fig. 5. Copper 80, Tin 5, Lead 15.—Shows lead lining out between the crystals. Due to increase in proportion of lead.

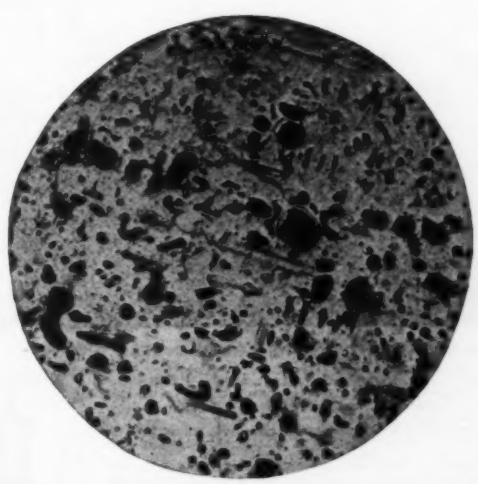

Fig. 8. Copper 71, Tin 10, Lead 19.—Lead more evenly distributed. Dendritic form again makes its appearance.

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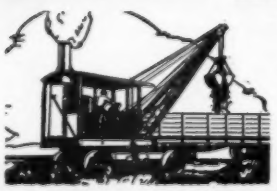

gation of the lead is noticed. This is a most important feature of the alloy containing lead from 15 per cent and up.

Examined with a magnifying glass the network of Cu_3Sn is plainly visible. This chemical compound of copper and tin does not show where the percentage of tin is below 10 per cent.

In Fig. 8 a better distribution of the lead is shown. It should be noticed that this is due to an increased rate of solidification, an important feature which will be discussed later.

The physical tests were made in accordance with the test code of the American Society for Testing Materials and included tensile strength, yield point, elongation and reduction of area. In addition, hardness tests were made by means of a Shore scleroscope.

Table No. 1 gives the results of these tests, omitting the yield point and reduction of area as being of less interest.

Table No. 2 gives the results of the tests made for the preliminary report. (See Pulp and Paper, p. 134, 1920.)

The mean value of the figures in the tables are shown in graphical form in Graphs 1 and 2.

TABLE NO. 1.

Alloy No.		Composition Cu-Sn-Pb	Tensile strength lbs. per sq. inch	Elongation per cent	Hardness Shore Scale
1	a	90-10	44,650	36.6	10
	b		44,650	30.0	
	c		44,700	36.0	
2	a	85-10-5	39,250	16.0(1)	10.5
	b		46,100	29.0	10.5
	c		47,350	36.0	
3	a	85-5-10	31,750	12.0	8.5
	b		33,850	12.0	
	c		32,800	22.5	
4	a	80-10-10	34,050	9.5(2)	10
	b		37,450	16.0	
	c		36,650	18.0	
	d		41,300	24.0	
5	a	80-5-15	28,300	16.2	7.2
	b		27,100	10.1	
	c		24,450	9.2	
	d		26,000	14.6	
6	a	76-9-15	34,000	13.4	10.2
	b		35,000	18.0	
	c		34,350	19.4	
7	a	70-15-15	31,000	none	17.5
	b		31,000	none	
	c		31,250	none	
8	a	70-10-20	32,300	20.1	10
	b		34,400	21.7	
	c		35,200	20.1	

Note—(1) Small dross spot, (2) slight flaw.

Along the abscissa on Graph No. 1 the composition of the various alloys has been arranged so as to show the effect of the increasing amounts of lead on the strength and ductility of the alloy, while Graph No. 2 shows the effect of decreasing amounts of tin on the hardness of the alloy.

An examination of these graphs reveals facts of great interest, and the conclusions to be drawn should be of considerable value to the users of acid resisting bronze.

TABLE NO. 2.

Alloy No.	Composition	Tensile strength per sq. inch
1	85-10- 5	27,806
2	85- 5-10	20,427
3	80-10-10	28,150
4	80- 5-15	22,810
5	70-15-15	24,630
6	70-10-20	22,985

In the first place, it is evident that, by increasing the tin (up to 20 per cent), an alloy of great strength and hardness is obtained. Note that alloys Nos. 1 and 2 have a tensile strength nearly as great as that of soft steel.

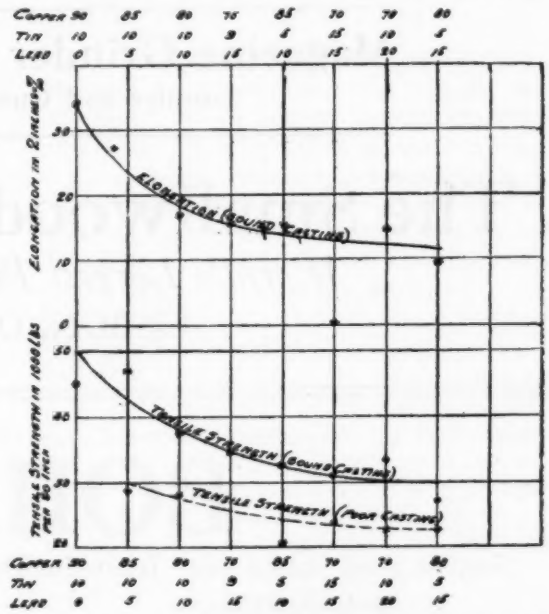
Copper 90 85 80 75 85 70 70 80
Tin 10 10 10 5 5 15 10 5
Lead 0 5 10 15 10 15 20 15
Elongation in Percent
30
20
10
0
ELONGATION (ROUND CASTING)
50
40
30
20
TENSILE STRENGTH (ROUND CASTING)
TENSILE STRENGTH (POOR CASTING)
Copper 90 85 80 75 85 70 70 80
Tin 10 10 10 5 5 15 10 5
Lead 0 5 10 15 10 15 20 15

FIG. 1 TENSILE STRENGTH AND ELONGATION OF ACID RESISTING BRONZE

Graph 1

Alloy No. 1, containing no lead, is, however, very hard to cast, and it was found to be very difficult to obtain sound castings.

The addition of a small percentage of lead greatly eliminated this troublesome feature, and, as shown by the curves in graph No. 1, up to 5 per cent lead the strength and ductility are not greatly affected.

Beyond 5 per cent lead, however, the strength of the alloy decreases rapidly, and it becomes also very brittle, No. 7, for instance, containing 15 per cent tin, shows no elongation whatever.

Graph No. 2 demonstrates the fact that the tin is the element principally influencing the hardness of the alloy. Alloy No. 7, in spite of the presence of a high percentage of lead, has the greatest hardness. The general conception that lead makes the alloy soft therefore does not seem to be borne out by the

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13	600	Edge Moor	200
20	600	Edge Moor	160
1	813	Edge Moor (A. S. M. E.)	200
Above located in du Pont Chemical Company's Plant at Hopewell, Virginia			
2	295	B. & W. (Stirling) located Carney's Point, N. J.	200
5	253	Stirling Class E No. 22	160
2	264	B. & W.	160
10	512	Stirling Class S No. 26	160
2	512	Stirling Class S No. 26	160
1	823	Stirling M-30 (A. S. M. E.)	200
2	550	Edge Moor	150
2	238	Edge Moor	150
1	231	Edge Moor (Ohio Standard)	150
1	199	Edge Moor	150
1	100	Smith HRT	100
1	50	Ames Locomotive	100
Above boilers located at du Pont Chemical Company's Plant, Carney's Point, N. J.			

MISCELLANEOUS

No.	Size, Hp.	Make	Pressure, Lb.
1	400	Stirling	150
2	400	Wickes	150
2	250	Wickes	165
2	250	Wickes	150
1	300	Wickes	150
1	225	Geary	150
1	250	B. & W.	125
2	210	B. & W.	125
1	125	Scotch Marine	125
1	78 x 20	H.R.T.	135
8	72 x 18	H.R.T.	125
2	84 x 18	H.R.T.	100
2	66 x 16	H.R.T.	125
2	66 x 16	H.R.T.	80
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investigation. That lead cannot have a very great influence on the hardness is furthermore evident from examination of the microphotographs.

The lead does not amalgamate with the other metals, but appears, when the percentage is sufficiently high, as solid masses of solidified lead in metal.

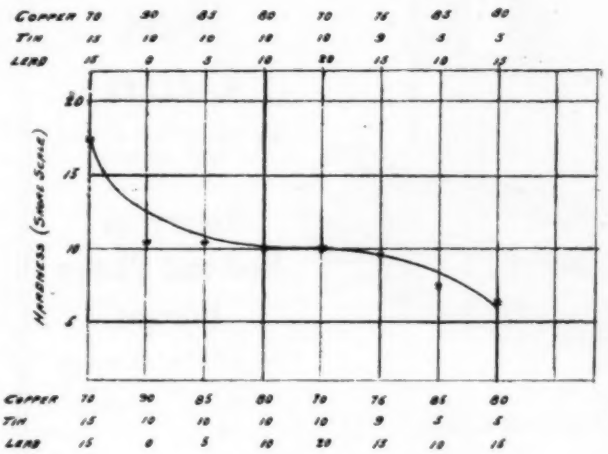

Fig. 2 Hardness of Acid Resisting Bronze

Graph 2

The dotted curve in Graph 1 shows the strength of the various alloys obtained from a certain foundry, and represents extremely poor foundry practice. It will be noted that the tensile strengths of these castings are over 10,000 lbs. less than that for the sound castings.

This fact is further brought out by the tests made on a test piece taken from a bronze digester sleeve which had given very poor service, and which had to be removed after a short time. The results of this test show:

Composition—Copper 85 per cent, tin 10 per cent, lead 5 per cent; tensile strength lbs. per sq. inch, 19,387; elongation in two inches 3.5 per cent.

This casting was very porous and spongy, which, of course, accounts for its poor wearing qualities, also the extreme brittleness of this casting. Fig. 9 shows the structure of the test pieces. It is extremely porous and contains blow holes over the entire surface. This condition is due to defects in the foundry practice.

The Acid Resisting Qualities of the Bronzes

The present investigation has established the fact that little or no conclusions can be drawn from laboratory tests as to which alloy best resists the action of sulphite liquor.

The different alloys have also been exposed to this action in a sulphite digester during a considerable period. In presenting the results of this test for what they are worth (table 3), it is recommended that fittings of various composition be tested under actual operating conditions and accurate records kept to show the performance.

Table 3 shows, however, that the increased content of lead in the alloy has no very appreciable effect on its acid resisting qualities.

TABLE NO. 3.

Alloy No.	Composition Copper	Tin	Lead	Per cent loss in weight after 3 weeks' exposure in Sulphite Digester
1	90	10	0	9.9
2	85	10	5	10.5
3	85	5	10	8.9
44	80	10	10	12.1
5	80	5	15	8.5
6	76	9	15	11.7
7	70	15	20	12
8	70	10	15	11.7

Conclusion

The present investigation has brought out the great importance of a good foundry practice. No matter what the composition of the alloy is, with poor foundry practice, the required strength, ductility or toughness and hardness is not obtained.

It should therefore be insisted on that all castings be free from flaws, dross, porous spots, and the surfaces free from scale, sand or loam.

Castings which do not meet these requirements should therefore be rejected.

As to the composition of the alloy, it is apparent that an increase in lead above 5 per cent does not fulfil any useful purpose. The strength and toughness rapidly decrease while, as far as can be concluded from the present tests, the acid resisting qualities are not materially affected.

Any effect of this constituent is probably due to

Fig. 9.—Test piece extremely porous and contains small blow holes over entire surface.

the fact that the presence of a high percentage of lead makes it very difficult to obtain a sound casting, with the result that acid eats its way into the interior of the casting, quickly disintegrating it.

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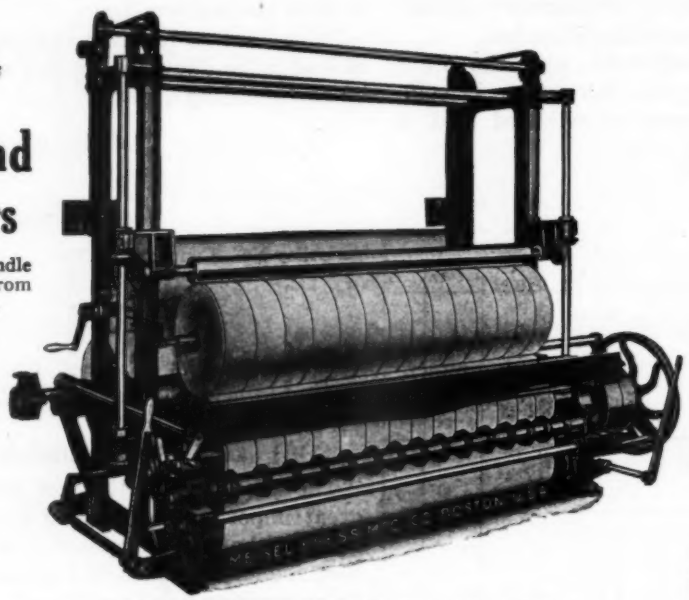

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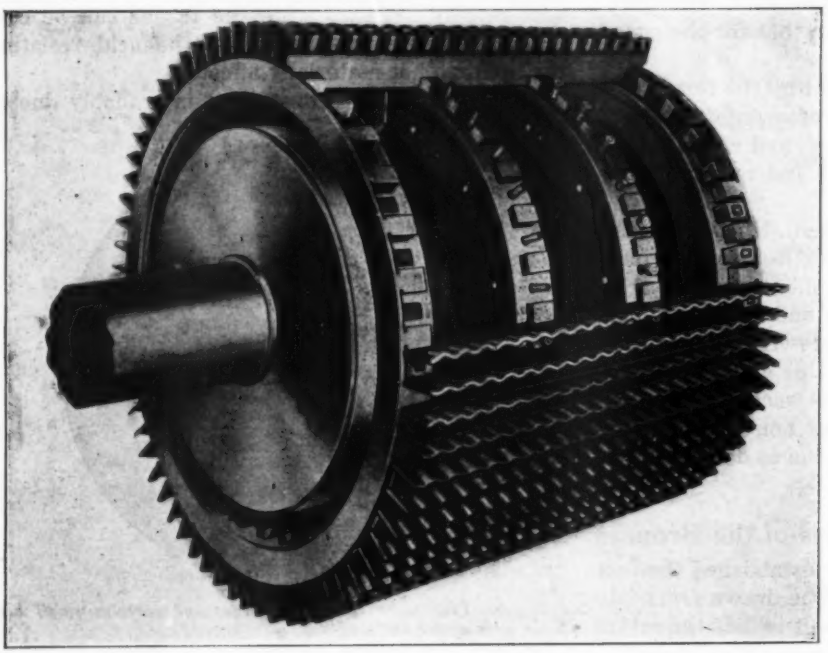

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hand, gives an alloy possessing great strength and hardness.

It should be noted, however, that an alloy containing over 10 per cent tin has a very complex freezing point curve; between 10 to 20 per cent there being no less than three distinct freezing points.

In its practical application this means that such an alloy solidifies in three separate portions, thus accelerating the tendency to segregation with the consequent decrease in strength and ductility.

The presence of phosphorus in the bronze, up to 0.1 per cent, has a very marked effect upon its properties, greatly increasing its strength and toughness and also notably facilitating the founding. It is therefore recommended that in any specification for bronze the presence of not less than 0.05 per cent phosphorus should be insisted on.

In taking the points brought out by the present investigation into consideration, the suggested specification for acid resisting bronze will then be as follows:

	Per cent
Copper	84½-85
Tin	9½-10½
Lead	4½- 5½
Phosphorous not less than	0.05
Impurities not more than	0.5

Addenda

In addition to the above, a few acid resisting metals sold under trade names, have been investigated.

Of these metals, two, "Aterite" and "Meco," have a very similar chemical composition.

They are both alloys, containing chiefly copper, nickel, zinc with a small addition of lead, silicon and iron. Of the two "Meco" is the higher in copper, while "Aterite" is the higher in nickel. "Aterite," as a matter of fact, appears very similar in composition to Monel metal.

Both metals have a very satisfactory tensile strength—40,000 lbs. per sq. inch—and the hardness ranges from 25-30 points (Shore scale).

The exposure of these metals to moist SO_2-gas shows that they are both affected to some degree. "Aterite" lost during an exposure equivalent to 31 days 2.5 per cent in weight, while in the same period "Meco" lost 1 per cent.

Both metals, therefore, appear to possess notable acid resisting qualities.

At the present time, however, the market price of these metals does not allow them to compete with the copper-tin-lead alloys.

The third metal investigated is sold under the name of "Promet Bronze." It is a copper-zinc alloy, with a tensile strength of 40,000 lbs. per sq. inch, an elongation of 48 per cent, and a hardness equal to 10 points. It is a very strong and tough alloy, but, owing to its high content of zinc, is hardly suitable for sulphite mill work.

B—Report on Investigation of Antimonial Lead

This investigation was made for the purpose of ascertaining the most suitable composition of antimonial lead used in the chemical pulp industry.

The questionnaire sent out by the Committee on Mechanical Standards brought out the fact that there is a great diversity of opinion among the different mills in regard to this composition. Some mills advocate lead with as little as 2 per cent antimony, while others favor a lead alloy containing 15 per cent antimony.

It is therefore apparent that an investigation of the physical properties of antimonial lead alloys should be of considerable interest to the members of the Technical Section.

Preliminary to carrying out the physical tests, a great deal of experimenting was done to obtain homogeneous test pieces. Chemical analysis showed that the antimony has a great tendency to segregate from the lead in mixtures containing over 13.5 per cent antimony.

This is particularly the case when the rate of solidification is slow. The test pieces, finally used for the testing, were carefully analyzed and were found to be sufficiently homogeneous. The test pieces contained antimony in proportions varying from 2.5 per cent to 17.8 per cent.

On each of these alloys the following tests were made: Tensile, compressive and transverse strength; elongation; reduction of area and hardness.

The tensile strength, elongation and reduction of area were determined on test pieces of the usual half-inch cross section, and are given in lbs. per square inch.

The compressive tests were made on cylinders having a height equal to 2 diameters, and are given in lbs. per square inch.

The traverse tests were made on 1 inch square bars, supported 8 inches apart. The hardness tests are expressed in points of the Shore scale.

The results of the tests are given in Table No. 1, and these figures representing the mean value of, in some instances, three tests, are presented in graphical form in Diagrams 1, 2 and 3.

In the table the figures giving the reduction of area have been omitted as being of less interest.

Physical Properties of Antimonial Lead

Test Piece Number	Composition		Transverse Test		Tensile Strength	Percent Elongation	Compressive Strength (1)	Hardness
	Sb.	Pb.	(1)	Max. Load				
1	2.8	97.2	257	746	3,696	35	3,084	1.7
2	5.5	94.5	615	1,065	3,610	30	2,664	2.1
3	7.5	92.5	777	1,150	4,810	30	6,174	2.4
4	10.00	90.6	527	1,386	7,240	18	8,838	2.9
5	11.95	88.05	944	1,442	8,000	20	7,250	2.9
6	12.76	87.24	815	1,442	7,653	14.5	6,976	2.6
7	14.10	85.90	.....	.....	6,344	4.5	8,050	2.6
8	14.93	85.07	1,007	1,636	.....	6.0	.....	2.6
9	15.93	84.07	1,052	1,605	6,456	4.5	7,670	2.6
10	17.49	82.51	1,302	1,538	6,759	3.0	9,170	2.6

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Diag. 1 shows graphically the tensile, compressive, and transverse strength, and Diag. 2 the elongation and hardness of the various mixtures.

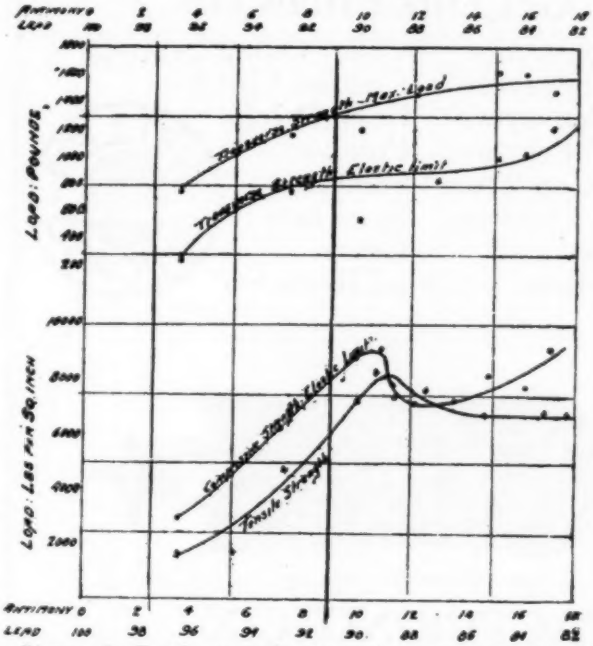
Load: Pounds
Load: Lbs per Sq Inch
Transverse Strength Mod. Load
Transverse Strength Elastic Limit
Compressive Strength Elastic Limit
Tensile Strength
Antimony 0 2 4 6 8 10 12 14 16 18
Lead 100 98 96 94 92 90 88 86 84 82

Diagram 1.—Tensile, comprehensive, and transverse strengths of antimonial lead.

Diag. 3 shows diagramatically how the test bars stand bending, the curved lines representing the bending of the bars at the point of failure.

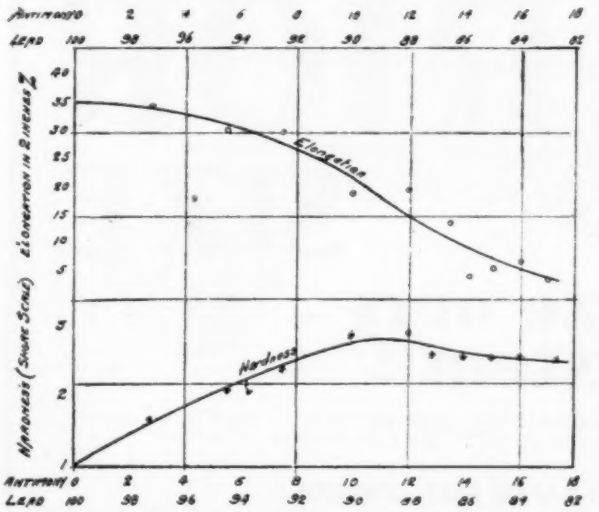
Elongation in 2 inches %
Hardness (Shore Scale)
Elongation
Hardness
Antimony 0 2 4 6 8 10 12 14 16 18
Lead 100 98 96 94 92 90 88 86 84 82

Diagram 2.—Hardness and elongation of antimonial lead

An examination of the diagrams reveals some very interesting information.

The tensile strength and the elongation increase with the addition of antimony up to 11 per cent.

Above 11 per cent the strength rapidly decreases, and above 13 per cent the metal becomes very brittle.

The compressive strength also increases up to about 11 per cent antimony; beyond this percentage, it shows an extreme irregularity. It should be remarked that compressive tests were made on cylinders compressed to one-half of their height. In many of the specimens containing a higher per cent of antimony, however, the test pieces partially broke along several cleavage planes in a crumbling way. These tests have therefore been omitted in the table as not representing the maximum load to one-half the height.

The maximum transverse load represents the pressure at which the bars failed.

It was attained shortly after the elastic limit had been reached.

The hardness tests show a considerable variation above 10 per cent antimony. When it is remembered, however, that above 13.5 per cent antimony the alloy consists of hard antimony crystals imbedded in a softer lead-antimony eutectic, it appears quite natural that a uniform hardness cannot be expected.

Conclusion

As antimonial lead is used principally for lead piping, the physical requirements of this will naturally be the governing factors in determining the composition to be used.

The requirements of a lead pipe is that it does not collapse under its own weight, and that it does not sag, creep or bend under exposure to the pressure and temperature of the digester relief gases.

On the other hand, it should withstand the blow of a heavy object and, if bent, it should not break. In other words, it should not be brittle.

A study of Diagrams 1, 2 and 3 indicates that the alloy containing 10 to 11 per cent antimony best fills these conditions. Below 10 per cent of antimony the tensile and compressive strength of the alloy decrease rapidly and while more plastic it is very soft. By an addition of more than 11 per cent antimony, on the other hand, no advantage is gained, as above this percentage the alloy becomes rapidly brittle. It is furthermore extremely difficult to obtain homogeneous castings with antimony present in proportions above this percentage.

The investigation has brought out the fact that good foundry practice is necessary in order to obtain a homogeneous alloy, and it is therefore recommended that the necessary chemical and physical tests be included in the specification for antimonial lead.

C—Report on Investigation of Bearing Metals

The investigation covered in this report is hardly more than preliminary, inasmuch as a subject of this magnitude requires a good deal more time than has been at our disposal.

A rather extensive search of the technical literature has been made for the purpose of finding out what has been done to standardize the bearing metals used for various duties.

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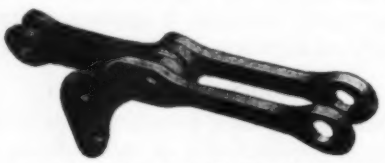

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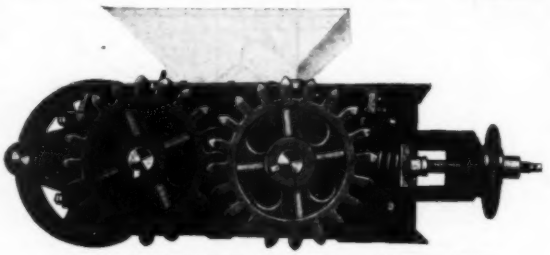

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It appears, however, that little or nothing is to be found, except what has been published by some of the railroads.

One most important fact has been brought out in regard to white bearing metals, namely that Babbitts with a high per cent tin have been entirely superseded by alloys containing chiefly lead and antimony.

The following formula is given as an example of the composition generally in vogue some years ago:

	Per cent
Tin	80
Antimony	10
Copper	10

This Babbitt has now been discarded by some of the largest railroads in America for a Babbitt, used for all general purposes, with the following composition:

	Per cent
Tin, not below	6½
Copper	½ to ¾
Antimony	14-16
Lead	77-79
Phosphorus	0.025-0.110
Total impurities, including zinc, iron, etc	under 0.5

This Babbitt is also used in bearings for electric motors under 5 horsepower in size.

Another metal, containing less copper and a somewhat higher percentage of antimony, and appearing under the name of Zero metal, has the following composition:

	Per cent
Tin	6.14
Copper	.10
Antimony	18.53
Lead	75.23

The present investigation has been confined to white metal alloys. It has consisted in an investigation of the physical characteristics of two Babbitts which, according to the returned questionnaires of the Mechanical Standards Committee, seem to be extensively used by some of the mills.

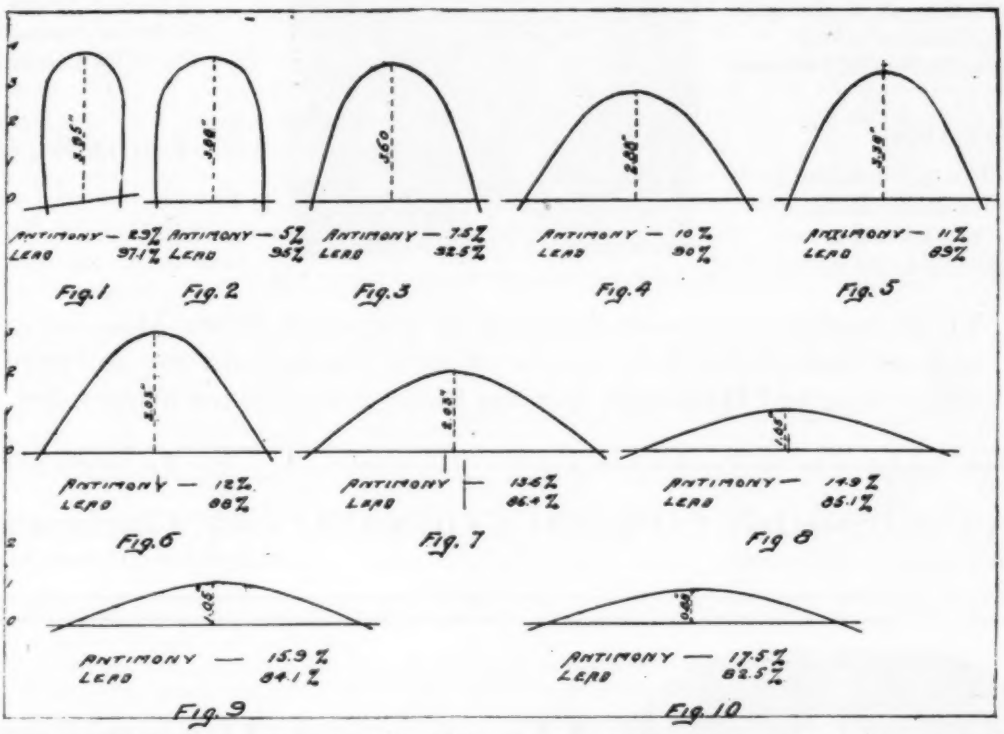

Diagram 3.—Antimonial lead alloys: .Transverse tests of 1 in. square bars, support 8 in. apart. Curves show amount of bending where failure occurred.

In addition, three metals, thought to be of considerable interest, have been similarly investigated. These metals appear on the market under trade names and are not sold on an analysis basis.

The results of these tests together with the composition of the metals is given in table No. 1.

The factors chiefly influencing the selection of a bearing metal are, its antifriction properties, wearing qualities, and price.

Of these three factors, the first two can only be determined through actual tests under actual operating conditions.

The third factor, price, is, of course, of considerable importance.

It is therefore thought that it would be of interest to give the relative cost of the bearing metals investigated. These costs are given in table No. 2, and they are based on the present market price of the metals of which they are composed.

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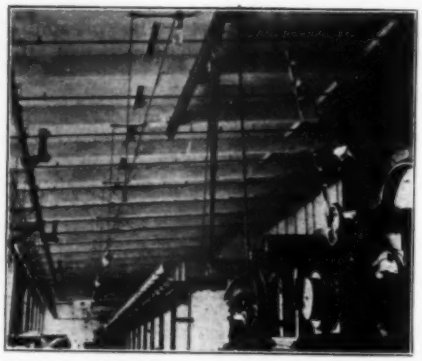

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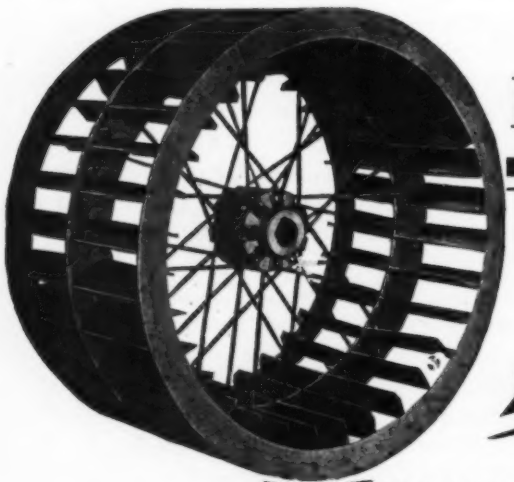

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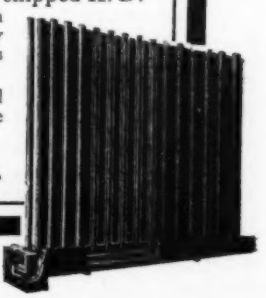

The prices of the metals constituting the alloys as quoted by Canadian manufacturers or wholesalers during the month of December, 1920, were as follows:

	Pound
Copper	$0.18½
Tin	0.50
Antimony	0.09
Lead	0.09½
Arsenic	0.12

The physical characteristics given in table No. 1 are very interesting.

Alloys Nos. 1 and 2 show good compressive strength, although No. 2 appears to be a good deal more brittle than No. 1. This resistance to pressure, one of the most important of the qualities of a bearing metal, is due to the presence of antimony.

The two alloys called Promet "Genuine" and "XX," although very low in tin, have a remarkably high tensile strength. Except for the presence of arsenic in these alloys, they appear to be very similar in composition with the railroad standard bearing metals. This presence of arsenic should be particularly noted. Together with antimony, it raises the resistance to pressure remarkably.

At the same time, it should be noted, however, it makes the alloy very brittle, as is shown in the low elongation of the Promet metals.

The last of the series, the metal called "Frary Metal," is one of the most interesting alloys appearing in recent years. It was developed in the United States during the war. As is shown in the analysis given in the table, it contains lead with a very small addition of metallic calcium and barium. This presence of small quantities of alkaline earth metals has completely changed the properties of the lead. Note its extreme hardness and high tensile strength. Although not quite so high in resistance to compression as Promet metals, it has an elongation more than four times that of the latter. It therefore has none of the brittleness of antimonial lead.

Tests made by the United States Bureau of Standards showed that a bearing made up of this metal, running under a load of 1,000 lbs. per square inch, at a speed of 400 R.P.M., was still in good condition after 23,200 revolutions, while a genuine Babbitt bearing running under a load of 400 lbs. per square inch, at 600 R.P.M., seized and began smoking after only 6,600 revolutions.

Table No. 2, taken in conjunction with table No. 1, shows pretty clearly that the strength, according to the wearing qualities, of the lead-antimony-tin alloys increases with the antimony, while the price increases with the tin. In general it can be said that the bearing metals mostly used are unnecessarily expensive. They too often contain higher percentages of high priced metals than is really required, a fact which, it may be mentioned, was borne out by the experience of European machine builders during the war ,when cheaper substitutes had to be used.

It is apparent that there is a great deal to be done along the lines of investigations of the properties of bearing metals, particularly in regard to many of the metals, such as alkaline earths, magnesium, etc.

TABLE 1—Physical Characteristics of a number of Bearing Metals

Name	Composition Copper %	Tin %	Antimony %	Lead %	Arsenic %	Hardness Shore Scale	Tensile Strength Tensile Strength	Tensile Strength Elongation %	Compressive Strength to Half Elastic Limit	Compressive Strength to Half Original Height
Babbit No. 1	1.0	60.0	8.9	30.1	....	2.86	9450	10.0	4615	12438
							9622	15.8	6446	12154
Babbit No. 2	2.0	44.5	9.0	44.5	....	2.78	7281	2.5	6585	9631
							7675	3.5	7015	9714
Promet "Genuine"	0.25	0.47	13.49	84.9	0.89	3.24	8546	5.0	4080	22945
							7730	2.5	4621	21060
Promet "XX"	0.25	0.38	13.58	84.60	1.19	3.29	8674	2.5	7040	20730
							8036	3.5	6552	21983
Frary Metal (1)	....	....	.....	99.8	....	4.39	13327	14.5	6115	14462
							15295	13.5	5308	11080

(1) Barium equals 0.82 per cent.
Calcium equals 0.12 per cent.

TABLE 2—Metallic Value of a number of Bearing Metals

Name of Alloy	Composition (Copper %	Tin %	Antimony %	Lead %	Arsenic) %	Metallic Value cents per lb.
Genuine Babbitt	10.00	80.00	10.00	.....	....	42.75
Babbitt No. 1 (1)	1.00	60.00	8.90	30.10	....	33.79
Babbitt No. 2 (1)	2.00	44.50	9.00	44.50	....	27.65
Railway Standard	0.50	6.50	16.50	76.50	....	12.08
Zero Metal	0.10	6.14	18.53	75.23	....	12.91
Promet "G"	0.25	0.47	13.49	84.90	0.89	9.67
Promet "XX"	0.25	0.38	13.58	84.60	1.19	9.64
Frary Metal (2)	....	....	.....	99.80	....	9.48(3)

(1) Babbitt used in Pulp and Paper Mills—See table No. 1.
(2) Barium equals 0.82 per cent.
Calcium equals 0.12 per cent.
(3) The prices of Barium and Calcium are not included.

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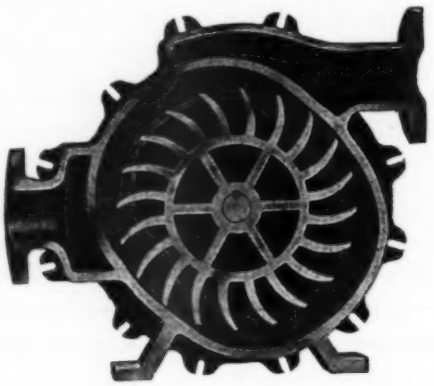

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Painting the Mill Interior in the Modern Way

By R. D. WALTZ

UNDOUBTEDLY all of our readers are familiar with the slogan, "Save the Surface and Save All," and are coming to realize that keeping the interior of the mill properly painted not only increases the amount of light to be had there and thoroughly protects the surface, but so affects the personnel working within its walls that greater all-around efficiency results. There is no question but that painting is one of the prime essentials of the day.

The importance of economy and efficiency in mill operation is recognized now as never before in recent years. The slower methods of yesterday on every hand are making way for the speedier, more modern ones of today. And the method of painting is no exception, the way of our fathers is being replaced with the improved, more modern process.

The application of paint with compressed air, or spray-painting, as the system is more commonly referred to, requires no elaborate introduction to mill operators. It might be well, however, to emphasize the point that the equipment used today should in no way be confused with the crude, laborious hand pump and spray outfit of years ago occasionally usesd in applying whitewash. This equipment is highly perfected, complete and practical in every detail, and thoroughly dependable in operation. In fact, it is of the same type that has been so satisfactorily used for years in applying varnishes and like finishes on furniture, automobiles, house fixtures and other articles of every description. The equipment is comprised of:

1. Air compressor, gasoline engine or motor driven, and air receiver and accessories, all mounted on a hand-drawn truck.

2. Paint container either of 7 or 13 gallon size, with regulating head and agitator.

3. Sprayer of standard separate container type, or special extension type in 3, 6 or 9 foot lengths for coating ceilings and walls without the use of scaffolding, and air and fluid hose in sufficient lengths for all requirements.

Where the mill has a sufficient supply of air, the air compressing outfit is not essential. However, where mill exterior painting is to be done, or work in parts of the mill where air is not to be had, it is necessary to have this unit.

The economies and advantages of the spray system over hand brushing are numerous, but the following are perhaps most outstanding:

1. Saving of time and labor.
2. Better, more thorough and cleaner work.
3. Less hindrance to mill operation.
4. Less scaffolding or staging.

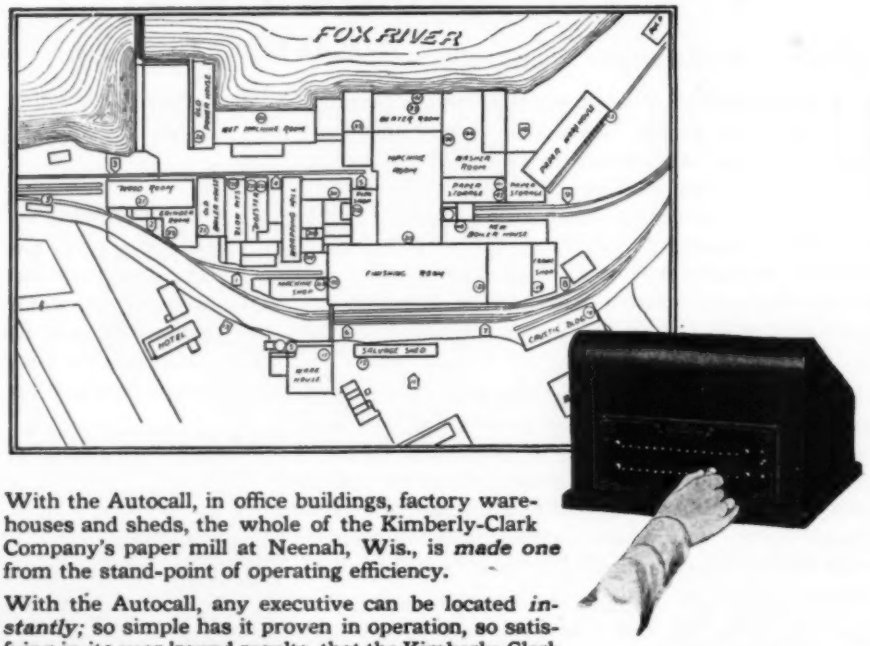
The speed of spray painting has been demonstrated on practically every class of work. Usually a brush hand is considered working at good speed if he covers 100 square feet per hour on the average job, and he is; whereas the spray operator will cover 400 to 600 square feet per hour on the same job without

overexerting himself. This saving of time and labor is an interesting item that one can ill afford to overlook.

It has been further demonstrated that there is no lessening of the quality of work in maintaining this average speed of spray painting. A complete and uniform coating is applied, every crack, corner and ordinarily inaccessible place receiving its proper amount of paint. The coating, therefore, gives all that is expected of it in service and is more durable. One sprayed coat is equal to two brushed coats in hiding capacity, and on many jobs it is possible to save material because of that quality. Spattering and dripping of paint are entirely done away with, and when the work is finished the surroundings will be found to be in much cleaner condition.

Many times when brush painting, it has been necessary to close down some sections of the mill or pay exorbitant overtime wages, due to the corps of men and the scaffolding required to do the job. These conditions are eliminated when spray painting.

Your Finger on the Entire Pulse of Production



The above plan of the Kimberly-Clark factory shows the location of the Autocall signal stations. The simple, yet efficient Autocall Central is also shown

With the Autocall, in office buildings, factory warehouses and sheds, the whole of the Kimberly-Clark Company's paper mill at Neenah, Wis., is *made one* from the stand-point of operating efficiency.

With the Autocall, any executive can be located *instantly;* so simple has it proven in operation, so satisfying in its year 'round results, that the Kimberly-Clark Company place more and more confidence in it and dependence upon it.

In operation. the Autocall is extremely simple. Important individuals are given code numbers, and if an official is away from his office or department, and is wanted for a conference or a telephone call, the telephone operator merely inserts a plug under his code number on the Autocall Central.

Instantly, his call is sounded from signal stations throughout office and factory, and from the nearest telephone, he gets in touch with the person wanting him.

Nor does Autocall service end there. With an Autocall Interior Fire Alarm System installed in conjunction, the Kimberly-Clark Company has ample assurance of efficient protection from fire. Thus is Autocall rendering Kimberly-Clark Company a double safeguard against two great elements of economic loss.

Your inquiry will be answered with detailed data and, of course, obligates you in no manner whatever.

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Conserves Time for Executives

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There is no interruption of mill processes because of the foregoing causes. Another example of this advantage is found in the painting of textile mill interiors with the looms running, it not being necessary to shut down any of the machinery while the spraying is going on. Where an extension spray can be used, scaffolding is often entirely eliminated.

Oil paints, mill whites, flat wall paints and other like materials are sprayed to equal advantage. Moreover, this method of application greatly increases the covering and light-reflecting qualities of these materials.

A final, important point to be considered is that the savings effected through the use of the spray system will entirely offset its first cost within a short time. This is a matter of record in those mills and factories where all inside and outside painting is done in this modern, improved and economical way.

Finding the Employee

By PHILIP C. PACK

WHAT is the meaning of those bells one constantly hears ringing in your buildings?" is a question commonly asked of many paper mill executives.

And yet this question is heard with less frequency nowadays, for visitors to such mills as those of A. P. W. Paper Co., Albany, N. Y.; American Paper Products Co., St. Louis, Mo.; Kimberly-Clark Co., Neenah, Wis.; Hammermill Paper Co., Erie, Pa.; Strathmore Paper Co., Wornoco, Mass., or a score of others throughout the United States and Canada, have grown accustomed to the occasional synchronized sounding of gongs in factory and warehouse.

Behind the ringing of those bells is the dominating idea of a single individual who believed that "a man is valuable only when available" and whose litany was "I want whom I want when I want him!"

Several systems are now being made which provide for the instantaneous sounding of a code signal, simultaneously, throughout any factory, plant, yard, etc. When an executive hears his code number ring, he has only to step to the nearest telephone, and presto! the operator puts him in touch with the person wanting him.

Or, working from the other, and most logical end for purposes of explanation:

Customer X calls for a conference with the sales manager. Mr. Sales Manager is out of his office and department, perhaps a quarter-mile away in an outlying building. Customer X cannot—**must not**—be kept waiting while an office boy or two are dispatched in search of him.

So the switchboard operator at the information desk plugs in Mr. Sales Manager's call, and instantly, throughout factory, warehouse, yard, etc., it sounds. Where there is a great deal of noise, a siren horn or even a whistle cuts the din with its compelling note. In offices, the mellow voice of an especially constructed bell takes up the search. In zones where even greater quiet is maintained, a buzzer announces to all within hearing that Mr. Sales Manager is wanted.

And what is the result? Customer X gets "whom he wants when he wants him!"

And yet it is the casual visitor to progressive mills like these who gets an impression that the mechanics of calling men is all that the most of these systems do.

Fire Alarm Signal

The business of calling men has developed and sponsored another great phase of the interior signalling business which is rapidly becoming an integral part of the great majority of progressive manufacturing, wholesaling and retailing establishments.

"Dual" systems which allow the instantaneous fire alarm signal to sound, and "Tri-service" systems, as made by one manufacturer, which forms a Watchman's Supervisory and Recording System, have come to the front in recent months.

One manufacturer of signalling systems has broadened one department to include the gratuitous organization of volunteer fire-fighting battalions for manufacturers using its equipment, and has issued a large edition of an elaborately made book, "How to Organize Fire Drills," showing the employment manager, in detail, how to perfect an efficient fire-fighting organization among his employees.

Yet it is with the primary system that modern-day business has built its system of keeping track of every man every minute of the day; the first-named system has allowed employers to keep one "finger on the entire pulse of production" at all times.

It would be interesting, indeed, to know just how many dollars are saved each year by allowing each man constant communication with every other man in hundreds of mammoth industrial organizations.

All the rules and regulations that can be adopted, all the Safety devices that can be attached to machines, all the guards which can be erected, and all the warning signs that can be posted are useless unless every man is careful to see that they are maintained and every man is careful to warn others of danger says the National Safety Council.

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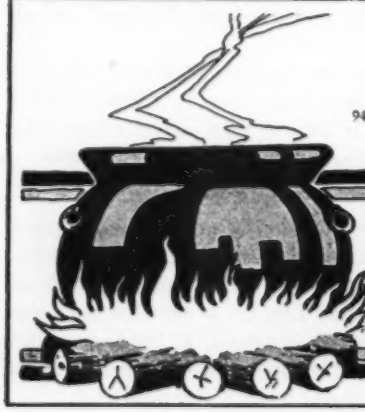

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SWENSON EVAPORATORS

Progress Being Made in Forestry Program

FORESTRY legislation in the session of Congress just closed reflected the growing demand of the public for protection of the forests, by increased appropriations. Following is a summary of the appropriations voted and available for the year beginning July 1, 1921: For fire prevention, $400,000, an increase of 220 per cent over the present year, which means increased appropriations by the states which share in this fund, for acquisition of land for National Forests under the Weeks law, $1,000,000, essentially a continuance of former appropriations; for the Forest Products Laboratory, $325,000, a considerable increase from the original amount voted by the congressional committee. This is progress, particularly in view of the fact that it was an economy session, but Congress realized that expenditures for forests are not expenses but investments.

The National Forestry Program Committee, which appeared with other agencies to advocate these appropriations, will proceed with its campaign in the next session, with the reintroduction of the Snell bill. It will also continue its work for the organization of state groups to secure state forest laws which will meet the conditions required for co-operation under the proposed federal statute.

Important developments are reported from many sections of the country. The United Typothetae of America, one of the greatest industrial associations, has endorsed the Snell bill. Other recent endorsements are from the Florida naval stores industry, California Forest Protective Association, and the Rotary Club of New York City. Dr. Hugh P. Baker spoke before the New York Rotarians, who then adopted a strong resolution, based on the need for forest laws to insure better housing and living conditions in New York, as well as for industrial consumption. He has also addressed several women's club groups on the subject in the last two weeks. E. T. Allen of this committee discussed the Snell bill before the California lumbermen at San Francisco. The protective association of that state in its endorsement says that whether the Snell bill passes Congress or not "its principles can and will be put into effect" in California.

Plans are already under way for the holding of the permanent meeting of the Central States Forestry Conference at Chicago before May 1, when it is planned to perfect the organization, arrange for financing its work and to begin the work of drafting forest legislation which will meet the needs of the member states. Some of the states are already pushing their campaigns.

Wisconsin will hold a state conference, called by the state manufacturers, women's clubs, lumber and paper manufacturers, and similar groups March 31 and April 1, to work for needed legislation. One bill already passed authorizes cities, towns and villages to buy and reforest land for public forests. A constitutional amendment for state forests is under way. Other legislation asks for adequate fire prevention and reforestation and to allow the state to secure tax title to cut-over lands.

The outlook is good for Ohio legislation, as the speaker of the house and many of the best men in the legislature are back of the bills. Col. Greeley will be given a formal invitation to speak to the Ohio as well as the Wisconsin legislature if he can visit those states.

F. E. Pape, state forester of Washington, advises that the legislature has memorialized Congress for an increase of the co-operative funds for fire prevention and forest aerial patrol.

Austin F. Hawes, field secretary for the Association of Wood Turners, one of the latest wood using organizations to engage a forester for improvement of industrial conditions, has issued a special circular to his membership in Michigan, Wisconsin, Vermont and Missouri, asking, "Why not have a National Forest in your state?" He calls attention to the fact that if federal legislation were passed, there is no enabling legislation to permit the purchase by the government of land in many states for National Forests. He calls attention to the Snell bill's provisions for land purchases, and tells how under similar provisions in the Weeks law such states as Maine, New Hampshire, Maryland, Virginia, West Virginia, North and South Carolina, Tennessee, Kentucky, Georgia, Alabama and Arkansas now have National Forests at the headwaters of navigable streams.

A recent Washington dispatch says that the National Forest Reservation Commission has approved the purchase of 58,853 acres at an average price of $4.70, in eight of the states named by Mr. Hawes.

Following is a list of endorsers to date:

Endorsements of the Snell Forestry Bill to March 10, 1921

STATE FORESTERS

Alabama	Maine	Ohio
California	Maryland	Oregon
Connecticut	Massachusetts	Texas
Idaho	Michigan	Virginia
Illinois	Montana	Wisconsin
Iowa	New Hampshire	West Virginia
Kansas	New Jersey	
Louisiana	New York	

STATE FORESTRY ASSOCIATIONS

New York	Minnesota	Kentucky
Massachusetts	Colorado	Texas
New Hampshire	Maryland	Connecticut
North Carolina	Ohio	California
Louisiana	Indiana	Michigan
Maine	Tennessee	Wisconsin

INDUSTRIAL ORGANIZATIONS

National Lumber Manufacturers' Association
American Paper and Pulp Association
American Forestry Association
American Newspaper Publishers' Association
Western Forestry and Conservation Association
United Typothetae of America
Florida Lumber and Naval Stores Association
California Forest Protective Association
National Wholesale Lumber Dealers' Association
National Paper Box Manufacturers' Association
National Box Manufacturers' Association
Eastern Paper Board Manufacturers' Association
National Paper Trade Association
Retail Lumber Dealers' Association of the State of New York
American Wood Preservers' Association
North Carolina Pine Box and Shook Manufacturers' Association
Pittsburgh Flood Commission
Union League Club, Chicago
West Coast Lumbermen's Association
National Forest Fire Prevention Committee
Chambers of Commerce of Pittsburgh, Springfield, Mass., Bangor
State Manufacturers' Associations of Michigan and Kentucky
Rotary Clubs of New York City, Battle Creek, Milwaukee, Colorado Springs and Syracuse

MISCELLANEOUS

Michigan State Farm Bureau
National Fire Marshall's Association (Particularly Fire Prevention Feature)
National History Club of New York

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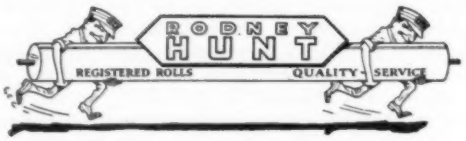

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GENERAL MACHINE WORK

Conference at Union League Club, Chicago

The Central States Forestry Conference is on the way to become a permanent organization for the pushing of adequate forestry legislation in the lake states.

A temporary organization, whose main object is the securing of essentially uniform legislation for forest policies for the states of this region, was formed at the preliminary conference at Chicago, through the courtesy of the Union League Club, on February 24.

With the conference ended, and plans well under way to make the organization permanent, it is safe to say that this conference marks an epoch in American forestry, for it is the beginning of practical effective legislation to restore the forests of the lake region, legislation to be backed by the best judgment of the forestry experts of the participating states, in consultation with all interests affected.

The chief speaker of the conference was Col. W. B. Greeley, chief of the United States Forest Service, and the whole tone of his addresses was that the problem of a timber supply is to be solved by making the idle acres produce trees, not by restriction of production, or restrictive legislation aimed at the present timber land owners. Col. Greeley's argument for forest legislation, and his explanation of the Snell bill was that America has been made great by liberal use of forest products, and to continue great we must be able to produce enough timber to continue this liberal use.

In passing it may be said that this attitude expressed before many prominent lumbermen who attended the conferences, was something of a surprise to the timbermen who have been accustomed to have every discussion of the forest problem center on an attack on the lumber man.

Col. Greeley's western trip was made at the instance of the Union League Club, which had determined to support the Snell bill, not only because of the direct bearing of the forest problem on the Chicago district industries, but because of the club's interest in the general good of the country, and the general relation of timber use to housing conditions, standards of living, etc. Col. Greeley before going to Chicago paid a visit to New England, to attend the twentieth anniversary of the Society for Protection of New Hampshire Forests, and to speak by invitation to the Massachusetts and New Hampshire legislatures.

The Union League Club, in addition to sponsoring the Central States conference, arranged a busy trip for the forest service chief. He spoke before the Association of Commerce of Chicago at noon, February 23, before the Milwaukee City Club that evening, and before the Central States conference at noon on Thursday. He slipped away long enough to talk to the University of Chicago and the Chicago Rotary Club before the Union League Club's evening dinner, where he was again the chief speaker.

The Union League Club had sent out an extended list of invitations to the forestry conference, and the response was notably large, there being 92 persons at the opening luncheon. This included the state foresters of Minnesota, Illinois, Wisconsin, Indiana, Ohio, and official representatives of the governors of Iowa, Missouri and Michigan. The conference opened with an address by Col. Greeley, in which he pointed out the reasons for state control of forestry legislation with federal leadership, and R. S. Kellogg spoke for the National Forestry Program Committee, telling of the aim to secure comprehensive practical national legislation which will spur the states to do their share. Philip W. Ayres of the New Hampshire society told how that state was preserving its forests, and Henry C. Campbell of the Milwaukee Journal told of efforts to secure legislation in that state. Others spoke briefly, after which a resolution was adopted formulating the method of securing six state delegates, appointed by the governor of each state, as members of a permanent conference, to be established as soon as the delegations from five states have been named. Each state formed a committee of five to confer with its governor on the naming of permanent delegates. The object of the conference was declared in this resolution to be the adoption "of a comprehensive and co-ordinated plan of forest conservation and reforestation." Prof. Filibert Roth of Michigan presided at an afternoon round table discussion of state problems.

Officers Elected

Officers elected to hold until the permanent organization is effected were:

President—David L. Goodwillie, Chicago, vice-president of the Union League Club, member of the Public Affairs Committee, and chairman of the Forestry Committee of the club, which sponsored the interstate conference.

Vice-President—E. E. Parsonage, Moline, Ill., president of the Association of Wood Using Industries.

Secretary—William L. Hall, formerly of the forest service, now of Hall, Kellogg & Co., Chicago, and who had been cooperating with Mr. Goodwillie as a Union League Club member, in organizing the conference.

Executive Committee—The above three, in addition to Calvin Fentress and E. C. Hole, Chicago; Dr. Hermann Von Schrenk, St. Louis, and Henry C. Campbell, Milwaukee.

Developments of the conference included a general discussion of problems of the various states. It was decided that fish and game protection, use of the forests for recreation, and the value of the forest in maintaining the water table in the soil of agricultural states must not be overlooked in working for future forest laws. Some of the developments reported from the various states were:

Illinois—An intensive study of reforestation by the state survey has been decided upon, and is provided for by $10,000 a year for salaries and $4,000 for traveling expenses in the state budget. The purpose is to determine the treatment of nearly 6,000,000 acres of forest land. This will, in addition to the state forester, give the forestry force a ranger, two cruisers, an economic forester and a field and a laboratory botanist.

Indiana—Legislation now pending to encourage forest growth by taxing forest growing land not over $1 per acre, when properly used.

Iowa—Legislation to encourage forestry by cutting in half the valuation of forest land has been introduced. Improvement of river and lake frontage by tree growth is to be encouraged in Iowa.

Michigan—Progress in Michigan was reported by all of its representatives. Possibly the most notable development was the announcement of the formation of a forestry department by the state farm bureau with F. H. Sanford as manager, to encourage the growing of trees on non-agricultural soil, and for the pooling of production and marketing of the tree crop.

Minnesota—This state is in advance of many others in its holdings of state land for forest production. Its handling of state land and timber is essentially on the lines so successfully applied by the forest service on national forests.

Missouri—Dr. Von Schrenk asked for the advice of the forestry conference in formulating legislation to be presented at once. He took a census of salaries paid state foresters, in order to determine what figure to place in his bill. Professor Dunlap of the University of Missouri said the cutting of Ozark timber was forcing the state to consider forest restoration.

Ohio—A general program for state forest legislation, providing for state forest purchases, fire prevention, and encouragement of private reforestation was reported by State Forester Secrest, who said the state was waking up to its needs, but not yet ready to spend all the money needed.

Wisconsin—An amendment to the constitution has been offered to authorize the state to acquire, preserve and develop state forests. This has to be adopted by two biennial legislatures, and then go to the state for a referendum. Bills are

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pending to give the State four parks, including State forest areas, for recreational use, as well as future timber production. One such park is to be located in 8,500 acres of virgin timber with 2,000 acres of area in 20 lakes, in addition. One city is planning a public forest, and others to plant trees along state highways leading to them.

The manner in which these states are now developing forestry programs was evidence not only of the need for harmonization of the laws in the same district with similar forest conditions, but also of the manner in which the national forest policy as proposed by the Snell bill will encourage state activity in the protection and reforestation of their own areas.

Meanwhile the work nationally has progressed to the point where the next session of congress may be expected to take up in earnest a forest policy.

Some of the latest developments have been:

Wisconsin retail lumbermen without a dissenting voice voted unqualified endorsement of the Snell bill.

Professor Bryant of the Yale Forest School discussed forestry legislation before the Connecticut lumber retailers, and Professor Chapman in an article in the Lumber World Review discusses the objections of C. S. Keith to the Snell and other forestry bills. This interest by retail lumbermen in forestry problems, as evidenced by the number of addresses being asked from foresters on forestry topics is a significant sign of the times.

News Miscellany

Trade Associations and Trade Journals

The relation of the trade association to the trade journal is only one of the many live points discussed in the new book, "Trade Associations," by Emmett Hay Naylor, Secretary-Treasurer of the Book Paper, Cover Paper and Writing Paper Manufacturers' Associations, just off the press. Mr. Naylor is not only widely known in the paper industry through his work as secretary for these associations, but he is nationally known in the trade association field as president of the American Trade Association Executives, and his new book, which has been published only after thorough study and long and careful preparation, therefore carries a double stamp of authority.

He discusses the efforts of some associations to publish their own trade journals, and adds: "This, at least, may be said: When a trade association undertakes a publication of any considerable size, for instance a monthly magazine, it may expect innumerable difficulties. The ideal arrangement in an industry is to have one or two good publications issued independently by private parties, and then for the association to have its own regular bulletin, of whatever size may be convenient, but issued as a matter of intimate information to the members each month, and in no way dependent upon subscriptions or advertising."

Mr. Naylor's book, however, goes much more deeply than this into the general work and field of the trade association, and not the least important portion is, in view of governmental activities in industrial fields, his discussion of the legal scope of an association, and particularly an avoidance of any attempt to even evade the law.

The value of the association to its industry and to the general public welfare is well analyzed, in the earlier chapters, and then goes into association routine, commercial and industrial functions, service activities, such as informative and protective, cost systems, statistical information, and concludes with two chapters on fair prices and the association and the law.

The entire book, which includes legal reference and a list of trade associations, is replete with references to the paper industry, and its associations, as examples of various means of providing service to association members.

T. A. P. P. I. Banquet and New Members

All the indications are for a large attendance at the annual banquet of the Technical Association, which will be held at the Hotel Astor, Broadway and Forty-fourth Street, New York, on the evening of Tuesday, April 12. Arrangements for the banquet follow the lines of previous years to a large extent. There will be responses to toasts by invited guests of distinction in the fields of chemistry and engineering and the courses will be enlivened by singing and music as formerly. Several new features will be introduced and held as a surprise for the evening of the banquet.

Elections to membership in the Technical Association of the Pulp and Paper Industry during the month of February, as reported by the Executive Committee, include the following:

Rolland W. Howell, vice-president, R. T. Vanderbilt Company, 50 East Forty-second Street, New York, N. Y.

William H. Kraske, sulphite mill superintendent, Consolidated Water Power & Paper Company, Wisconsin Rapids, Wis.

Harry P. Ottinger, chemist, W. C. Hamilton & Sons, Riverside Paper Mills, Wm. Penn P. O., Montgomery County, Pa.

Paul F. Wehmer, analyst and microscopist, Electrical Testing Laboratories, Eightieth Street and East End Avenue, New York, N. Y.

Woodlands Section Announce Annual Meeting

At a recent meeting of the Executive Committee of the Woodlands Section, of the American Paper and Pulp Association, it was decided to hold the annual meeting on April 13th, at 10 a. m., in the Waldorf-Astoria Hotel, New York City.

The following subjects have been selected for discussion at this meeting: "Tractors on Snow and Ice Hauls," "Sinkage of Pulpwoods on Drives and in Storage," "Woods Operations Costs," "Slash Disposal."

The more general the discussion of these subjects, the better will be the results and members are asked to bring along their "operating dope." Practical woods operators will discuss these subjects from their own experiences and it will be interesting to find out what others have done and how operations can be improved.

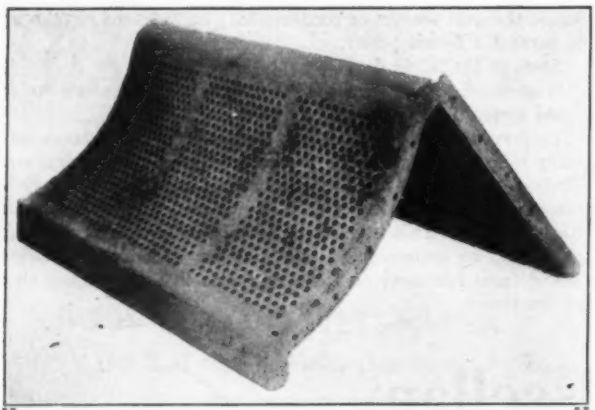
Woods Operations Experiments

Replies to the recent questionnaire sent out by the Woodlands Section show surprising interest in the experiments of pulp and paper companies in connection with their woods operations.

Probably the greatest interest centers in the use of tractors, especially in connection with grades on snow and ice hauls. The diversification of interest is shown by the following, in reply to the question: "On what subjects would you like experimental data collected?"

1. Data in regard to sinking of four foot wood compared to logs.
2. Flume transportation of pulpwood.
3. Conditions affecting reforestation of burned areas.
4. Effect of decay on sinkage of soft woods.
5. Mechanical Felling and Bucking Saws.
6. Painting pulpwood for identification.

The Forest Experiment Committee of the Canadian Pulp and Paper Association is also active in the collection of information along these lines, for the Canadian mills. It is



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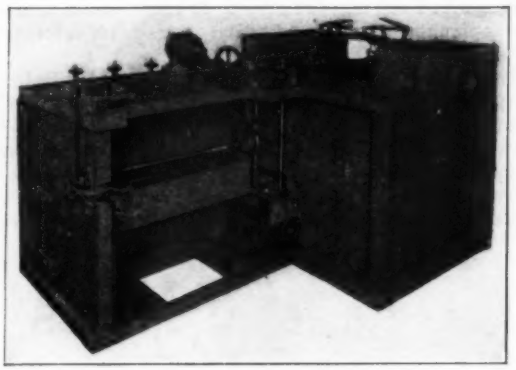

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3—This means better running conditions on the machine and increased production of paper.

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JOHN W. BOLTON & SONS, Inc.

LAWRENCE, MASS.

Intensive specialists in the manufacture of uniformly high grade machine knives for the pulp, paper and board industry

planned to have a meeting of the two committees before the Annual Meeting, scheduled for Wednesday, April 13th.

The result of these investigations will be published in the form of an Index of the woods experiments of pulp and paper companies, giving lists of experiments performed, with the companies having made the experiments and, so far as possible, the results obtained.

The Woodlands Section is performing a distinct and practical service in conducting an exchange of information between its members in order to bring them closer together and that their problems in connection with the management and exploitation of timber lands might be assisted by the receipt of information from the experience of other operators.

The following are examples of requests being sent in:

Depletion Charges

One of the members recently purchased some 3,000 acres of timber land, with a merchantable stand of 40,000 cords of pulpwood, for $50,000, in round numbers. They plan to cut this off at the rate of 2,000 cords per week, and ask the question: "Is it logical to charge off this initial investment of $50,000 on the basis of the tract's forest capital in twenty years?"

This is an interesting question on which the Section would be glad to have expressions of opinion from members handling similar problems.

The following request is another which has been received: "Can you send us any information on the Shrinkage of Pulpwood Logs, measured by the cord, and then cut to 4 ft. lengths and measured?"

Secretary O. M. Porter would be glad to hear from any of the members of the Section who have had experience along these lines, and it is announced that opinions expressed on these questions will be reported back to the membership.

A New Local Division of the Cost Association

A new local division has just been organized in the Berkshires to be called the Berkshire Local Division of the Cost Association of the Paper Industry.

The first meeting of this Association of this Division was held on Friday, March 11th, at the Wendell Hotel, Pittsfield, Mass. Dinner was served at 6 P. M. and twenty-one representatives of various paper mills in that vicinity, some coming from as far as Troy, N. Y., enjoyed a very appetizing meal.

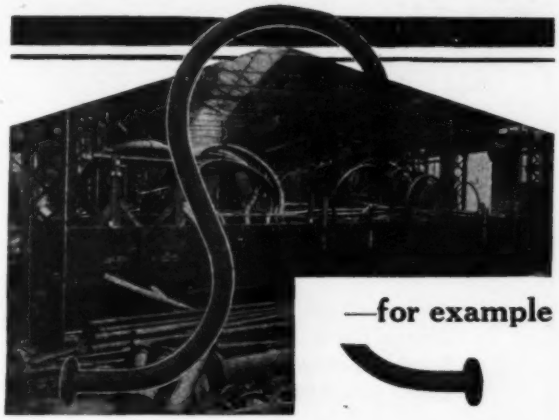
Dinner was also attended by Mr. S. L. Bush, President of the Cost Association, and the Secretary-Treasurer, Mr. Thomas J. Burke. Mr. Bush gave an informal talk after the dinner, in which he clearly set forth the reasons for the existence of the Cost Association, what it aims to accomplish and what it has already done. Following his talk, questions were asked on various phases of cost accounting and were answered by him. Mr. Burke raised an interesting point when he stated that during a recent meeting of the Philadelphia Local Division he had heard Mr. Hilton, who is a partner in the firm of Messrs. Barrow, Wade, Guthrie & Company, well known public accountants, and an expert in tax matters, state that it was his opinion, also that of a prominent lawyer, that it was not always advisable for corporations or firms to sign the "waivers" sent out from time to time by the Federal Tax Bureau. It appeared that a number of corporations in this district had already signed these waivers and a very interesting discussion followed.

During the evening an election of officers took place when Mr. G. S. Gordon of the Smith Paper Company, Lee, Mass., was elected President of the Berkshire Local Division and Mr. C. W. Gould, Jr., of the L. L. Brown Paper Company, Adams, Mass., was elected Secretary-Treasurer.

It was decided to hold meetings monthly, also, that there should be no dues, but that the expenses of each meeting should be cleaned up monthly.

Meeting adjourned at 10:30 P. M.

UNUSUAL PIPING



This carload of Expansion Bends

and other fabricated piping installed by our erecting crew at the Fisher Body Co. plant in Cleveland, was unusual because of the variety and special requirements of the work.

The unusual problem in modern piping is the most usual task that comes to the M. J. D. Organization Headquarters. The most intricate design is not beyond the capabilities of our engineers. Our years of experience in fabricating and erecting **piping systems for every purpose** justifies our claim to specialists in this work.

United Paperboard Co.
West Virginia Pulp & Paper Co.
Allen & Reed, Inc.
American Locomotive Co.
Diamond State Fibre Co.
M. A. Hanna Co.
Heine Safety Boiler Co.
Hershey Chocolate Co.
Union Mills Paper Mfg. Co.
Virginia-Carolina Chemical Co.

A list of plants that rely on M. J. D. piping service would read like a roll of honor of modern plant efficiency. A few are listed at the left. Each of these installations were different—each an individual engineering problem. Conditions governing operation made each it so.

Increased Facilities

Having recently acquired increased facilities by taking over a larger plant, we are now in a better position to offer our services to a larger field of clients.

As Piping Fabricators and Contractors we can handle your entire installation from the time you conceive it until it becomes a finished M. J. D. product. Or we can cooperate with your engineers, fabricating and erecting the piping according to your plans, or, we will furnish materials only.

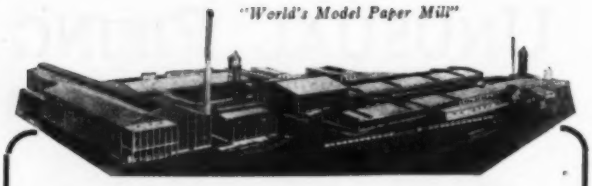
Our prices are right up-to-the-minute—LOW.

Let us send you our Bulletin N-3

M. J. DOUGHERTY CO.
PIPING FABRICATORS & CONTRACTORS
FACTORY & MAIN OFFICES—25th & WASHINGTON AVE. PHILA. PA.

OUR LINE

"World's Model Paper Mill"



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Pure, Genuine Vegetable Parchment
Waxed Paper, plain or printed
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Blood-proof Meat Paper

These four grades of paper made in our Mill by contented, conscientious and skilled folks.

Both jobber and customer will be satisfied; they get their money's worth in the purchase of KVP brands.

Quick Delivery—any quantity. Ask for Samples.

Kalamazoo Vegetable Parchment Company
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In Good Operating Condition
For Immediate Delivery

4 Beaters, Noble & Wood, 72″x44″ wood tub.

1 Beater, Dilts, 62″x50″ with iron tub.

1 Stack Machine Calender, 112″ face. 10 rolls, bottom 20″ diam., 1-14″, 7-9″, top 14″. Equipped with box cored frame, rolls removable through side. Doctors, Levers and Weights, complete with Marshall Drive, self-contained 7″ Mortise gear and friction clutch pulley. Rolls recently reground.

18 Dryers, 48″x68″ face.

10 12 Plate openside Packer Screens.

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175 Richdale Ave. Cambridge 40, Mass.

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PAPER and BOARDS
ALL GRADES

Direct Mill Service to the Paper Merchant

SERVICE is the greatest factor in mill representation. Prices, samples and information on any grades of paper and boards, will be furnished upon request. Exclusive representation of paper and board manufacturers enables us to offer direct mill service. All sales made for the mill direct to the paper dealer.

Berton Hill Company
INCORPORATED

Exclusive Mill Sales Agents
501 Fifth Avenue at 42nd Street
NEW YORK CITY

The
Hinde & Dauch Paper Co.

Corrugated
Fibre Shipping Boxes
and Packing Materials of
Acknowledged Superiority

Sales offices in principal cities

MAIN OFFICE
SANDUSKY, OHIO

Meeting of Northern New York Cost Division

A meeting of the Northern New York Local Division was held at Watertown, N. Y., on Thursday, March 10th, at the Black River Valley Club. A very appetizing dinner was served at 6:30 P. M., when about twenty-five sat down.

The dinner was attended by Mr. G. A. Ware, cost accountant of the Newsprint Service Bureau, also Mr. Thomas J. Burke, Secretary-Treasurer of the Cost Association of the Paper Industry.

Mr. Ware gave a very interesting account of the work being done by his bureau in standardizing cost accounting procedure in newsprint mills. He showed that he had a thorough grasp of his subject, particularly with the difficulties encountered in keeping track of the costs of ground wood conversion.

Mr. Burke spoke shortly about the work now being done by the Cost Association. He appealed to all the cost men present to remember that they had very important work to do, particularly at this critical time in the paper industry, and that it therefore behooved them to use their best endeavors to avoid friction in any way with the superintendents of the mills or the men working in the mills. He particularly emphasized the importance of gaining the good will of the latter.

Mr. J. C. McCormick of Knowlton Brothers, who is President of the Northern New York Local Division, and Miss Amy Lofink, of Taggert Brothers, who is Secretary, are to be congratulated on the success of this meeting.

The Fourth National Exposition of the Printing, Advertising, Publishing, Lithographing, Paper Making, Stationery and all Allied Industries will be held April 25 to 30, 1921, at the Twelfth Regiment Armory, New York City.

It is said that vast, potential buying power and advertising possibilities exist in this exposition, which is to be held coincident with the Convention of the American Newspaper Publishers' Association and the Associated Press.

Alaska's Debut in Wood Pulp Industry

Alaska now is manufacturing wood pulp. The Department of Agriculture has announced the receipt of samples of the first run from a new mill established near Juneau in the Tongas National Forest. Forest service officials, after examining the samples, declared that the establishment of the mill marked another milestone of progress in pulp production for the news print industry.

The mill near Juneau is the first to be established in the territory, and is operated by hydroelectric power. It has a capacity of twenty tons of pulp a day, with power resources available for increasing the output to 250 tons. The samples received here are spruce pulp, but hemlock also will be ground. Later it is planned to enlarge the mill so as to make paper.

Forest service officials said an area of the Tongas National Forest containing 2,000,000,000 feet of pulp-making timber would be placed on the market soon in response to inquiries from prospective paper manufacturers.

Large Paper Mill in Sweden Rebuilt

A large paper mill at Vargo, Sweden, was recently rebuilt on the most improved lines. Formerly 20,000 tons of coal were consumed annually, and the problem of maintaining this supply was a very serious one, but at the present time no coal whatever is consumed at the plant. The boiler house contains seven "electric" boilers, each of 3,000 horsepower, and the current enters the boilers at a pressure of 10,000 volts, without having to be stepped down. Each of the boilers is provided with three electrodes and the coupling arrangements are such that steam generation can be regulated within 5 per cent. It is stated that full steam pressure can be raised in from five to ten minutes after switching on the current, and considerable economy in attendance is obtained, as compared with coal firing.

Diamond Soot Blowers Mean Greater Profits

THE big central stations place a definite reliance upon Diamond Soot Blowers to earn dividends. They know that to pay real profits they must cut the cost of producing power to a minimum. Their very existence, as a matter of fact, depends upon efficient, economical plant operation.

With perfect unanimity of action the big central stations have adopted as one of the fundamental principles of efficient boiler operation the rule that all boiler heating surfaces must be kept free of soot and ash deposits, clean as only Diamond Soot Blowers can make them.

The illustration at the top of this page shows the Union Electric Light and Power Company's St. Louis plants where Diamonds are installed. Among hundreds of other central station users of Diamonds the following are typical:

Buffalo General Electric
Beech Bottom Power
Detroit Edison
Appalachian Power
Philadelphia Electric
Southern Power
Scranton Electric
Erie Lighting
Haverhill Electric
Central Illinois Public Service

Whether you operate a central station or an industrial power plant your 1921 profits will be seriously affected if you do not keep your boilers in first class, efficient condition. Diamond Soot Blowers will increase your dividends out of all proportion to the cost of the equipment.

Write for Bulletin 290

DIAMOND POWER SPECIALTY COMPANY
Detroit, Michigan

Diamond

SOOT BLOWERS - SAVE 4 to 8% FUEL

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STEBBINS ENGINEERING & MANUFACTURING CO.

WATERTOWN, - NEW YORK

Special Sulphite Mill Equipping

Agents for the Heiskanen Pulp Bleaching Apparatus.

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STEAM PLANTS

Examinations
Reports
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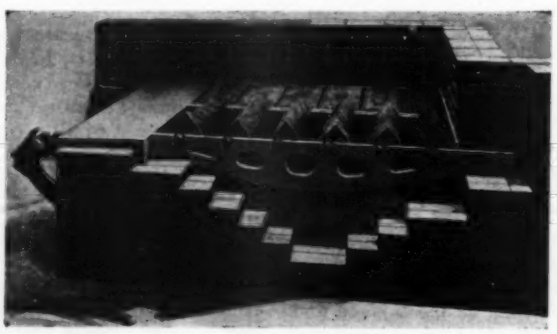
CYCLONE Grate Bars

Manufactured by
CYCLONE GRATE-BAR CO.
Buffalo, N. Y.

Metal Uniformly Distributed

Each Grate a Solid Casting

Will Outlast Any Grate Made



Takes Care of Expansion and Contraction

Will Not Warp

Easy to Install

Cyclone Grates will save at least 10 per cent in fuel, over stationary grates.

CYCLONE Grate Bar Co.
BUFFALO, N. Y.

Plan New Paper Mills

Simultaneous with the opening of the new $5,000,000 power plant of the Ontario Hydro-Electric Commission on the Nipigon river, three companies announced that they propose to build paper mills, which will make Port Arthur and Fort William the largest paper and pulp manufacturing centers in Canada.

The Provincial Paper Mills, that recently acquired a pulp wood limit of 1,220 square miles, will erect a paper mill as an addition to its 50-ton per day pulp mill; John Sirrett & Sons will erect a 100-ton per day pulp mill, and the Kaministiqua Pulp and Paper Company will increase the capacity of its plant from 25 to 100 tons a day.

Two Large Canadian Bond Issues

Shareholders of the Howard Smith Paper Mills, Ltd., have approved the proposal to authorize $7,000,000 of 7 per cent twenty-five-year sinking fund mortgage bonds, of which $1,000,000 will be issued, $2,500,000 will remain in escrow, and $3,500,000 in the treasury.

The Abitibi Power and Paper Company directors have approved the sale to bankers of $4,000,000 of 8 per cent ten-year consolidated mortgage sinking fund bonds, issued for reimbursing the treasury for construction expenditures on a new plant.

Personnel Changed in Two British Columbia Mills

S. H. Garrigan, who has been appointed local manager of the Whalen Pulp & Paper Company, in Vancouver, B. C., is well known as a capable sulphite pulp maker, having had extensive experience with the International Paper Company, and the United Paper Board Company, the latter of Lockport, N. Y. T. W. McGarry, the new president of the company, is expected in Vancouver in a couple of weeks, and in the meantime affairs are being looked after by U. M. Waite, vice-president of the Reliance Mill & Trading Company, in the hands of which concern the affairs of the company have been placed.

Another change in the personnel of the pulp industry of British Columbia is announced by the Western Canada Pulp & Paper Company, whose mill is at Port Mellon on Howe Sound. The office of president has been changed owing to the removal of the head office to Toronto. H. J. Daly, president of the Home Bank of Canada, now fills that office, succeeding E. M. Davis. Henning Helin has been appointed general manager for British Columbia. He is an experienced pulp manufacturer, having been for six years manager of the Wayagamac Pulp & Paper Company, ten years in the manufacture of pulp and paper in Sweden, and is a graduate of one of the largest technical colleges in Sweden. The Port Mellon plant, which has a capacity of forty tons of pulp per day, will probably resume operations in a month or so.

To Improve Water Supply for Coos Pulp Plant

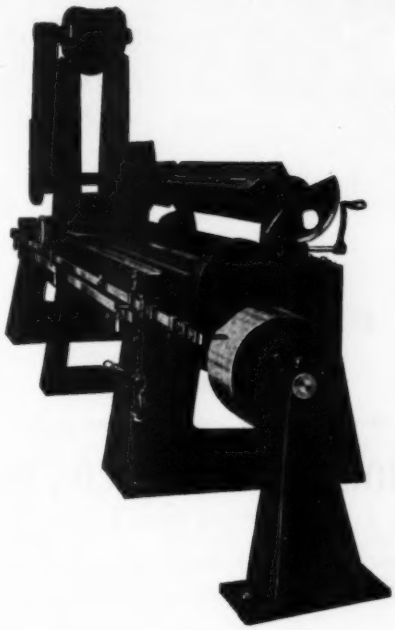
Recent investigations made at Marshfield, Ore., by persons who are figuring on a pulp mill disclosed a lack of sufficient water supply during the summer months, although there is plenty to be had during the fall and winter.

The visitors spent some time in looking over the various projects for an adequate water supply, and decided a scheme originated there by Henry Diers and other local engineers, whereby the fresh water of south inlet would be impounded, would answer the needs of a pulp mill and also supply the future growth for many years.

A movement is being organized in which both the municipalities of North Bend and Marshfield, and the port of Coos Bay are expected to join, to enlarge the present system and add to it the south inlet project.

The box board plant of the Fort Wayne Corrugated Paper Mill, Hartford City, Ind., has resumed full operations for the week.

Automatic Knife Grinders



For Paper Knives, Rag Knives, Barker Knives, Adzing Knives, Stop Cutter Knives, Planer Knives, High Speed Knives, Veneer Knives, Stave Knives, Hog Knives, Tobacco Knives, Huller Knives, Stone Knives, and all knife and shear blade grinding requirements—Straight or Spiral Edge Grinding, Flat or Concave Bevel.

Straight Wheel, Cup Wheel, Ring Wheel Grinders. A complete line of full automatic machines of all sizes, types and styles. A machine for every service.

Write for catalog and secure our recommendations as to the machine best adapted for your requirements

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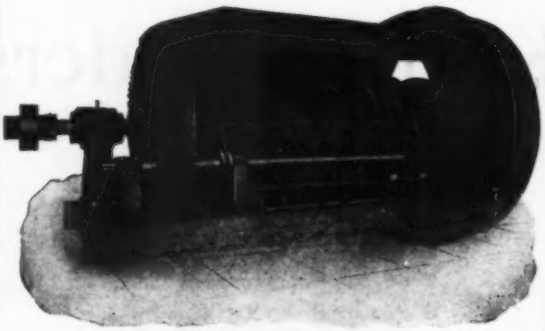

Illustration shows horizontal unit developing 2,400 horsepower under 42 feet head, at

88% EFFICIENCY

installed at Glens Falls, N. Y., Mill of International Paper Co.

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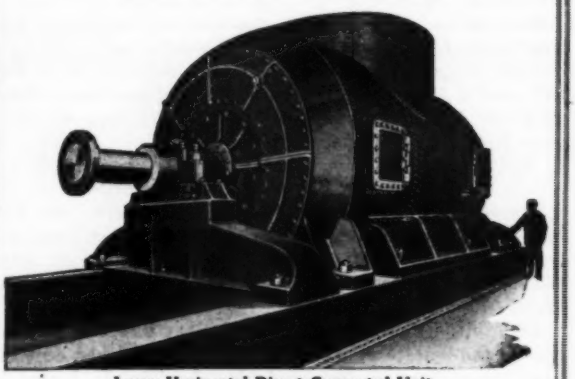

Large Horizontal Direct Connected Unit

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The JAMES LEFFEL & CO.

SPRINGFIELD, OHIO

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Guaranteed Perfect

Draper Hollow Balanced Brass Balls

FOR STUFF PUMPS

Absolutely balanced; will not pound out of shape

Specify these when ordering new pumps.

Order these to replace worn-out balls.

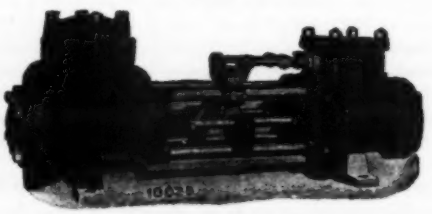
We also manufacture—

SOLID BRASS BALLS
IRON AND STEEL BALLS
BALL CHECK VALVES
VALVE FACING TOOLS

The Draper Manufacturing Co.

Port Huron, Mich. Petrolea, Canada

Every ball bears our registered trade-mark



When buying a pump it is well worth your time to make a careful selection and carefully compare the various features to be considered in choosing the proper pump for the service to be performed. We would like to be of assistance in advising the purchaser the vital points which we consider of importance in making a selection and feel our fifty years' practical experience should be of some value.

Send for Catalogue 127

DEAN BROS. STEAM PUMP WORKS. INDIANAPOLIS.

Smallest Paper Machine in the World

The smallest paper mill in the world recently was seen in operation in the machine room of the Oregon Pulp & Paper Company, according to the Salem Journal.

The mill was designed and built by Joe Trasker, superintendent of the paper company, in his spare time, taking him two and one-half years to complete it. Mr. Trasker made every part of it, even turning out the small bearings.

It is as complete as any of the machines in operation in the paper company's plant, even more so, having its own boiler and engine at the head of the truck.

When running slowly the mill will make about a foot and a half of light tissue paper a minute, but can be increased to greater speed such as the strength and kind of paper will permit.

The weight of the machine is about a ton, and stands on the truck about two feet high, the length of the whole thing being nearly ten feet.

Machine Tender Jack Spresser had charge of the operation of the machine.

Inland Empire Co. Holds Election

At the annual meeting of the Inland Empire Paper Company, Spokane, Wash., Judson G. Rosebush, of Appleton, Wis., was reëlected president; L. M. Alexander, of Port Edwards, Wis., was elected vice-president; W. E. Rosebush, treasurer; W. A. Brazean, secretary, and J. E. Alexander, trustee.

Fire Destroys Buenos Aires Plant

Fire destroyed a large part of the paper mill owned by the General Match Company of Buenos Aires, Argentina, on March 3. The loss, it is estimated, probably will reach 500,000 pesos (about $250,000).

Kalamazoo's Daily Paper Output Averages 700 Tons

In an interesting address before one of the recent weekly meetings of the Kiwanis Club of Kalamazoo, Mich., Fred M. Hodge, president of the Kalamazoo Paper Company, emphasized the preëminence of Kalamazoo as the country's leading city in the manufacture of paper.

From an original production of five tons a day he showed the normal output in the city proper had grown to 700 tons daily, while in what is known as Kalamazoo's blanket field, reaching from Otsego to White Pigeon and stretching east and west from the Rex Paper Company's mill to Watervliet, the production averaged 1,200 tons.

Recalling the origin of what has become the city's greatest industry and made it famous throughout the country, Mr. Hodge told how a man from Fitchburg, Mass., came to Kalamazoo, October 1, 1866, explained the process of paper manufacturing and cited the advantages this city apparently possessed for entering the field. Three days later the Kalamazoo Paper Company, the pioneer organization, was formed and a wooden mill was built on the site of the present Monarch mill, three miles south of the city, manufacturing white paper out of bleached straw. This mill was burned in the winter of 1871-72 and was immediately replaced with a brick structure.

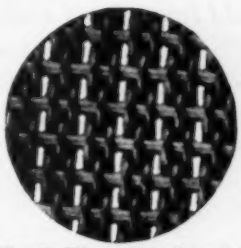
To Pay Million in Dividends

A stock dividend of $1,000,000 has been declared by the Michigan Paper Company, Plainwell, Mich., which at the corporation's annual meeting increased the capitalization of the company to $2,000,000. J. D. Wagner was reëlected president. The company is the second oldest paper concern in the Kalamazoo valley.

James Rosenberg, president of the American Woodpulp Corporation, 347 Madison avenue, New York, has returned from an extended trip to Europe, where he visited in Scandinavia and other countries.

TYLER

Triple Warp Fourdrinier Wire



Triple Warp Fourdrinier Wire, Magnified Section

TYLER

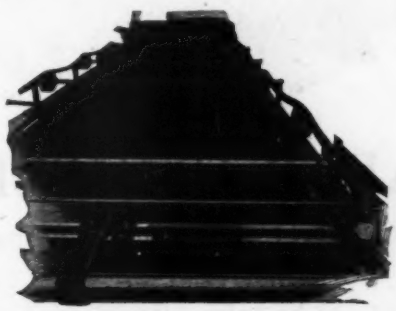
Triple Warp Fourdrinier Wires

The Tyler Triple Warp Fourdrinier Wires are made from phosphor bronze wire and are used for making finer grades of light weight paper, such as carbon, cigarette, high grade tissue, India and Bible papers, and other specialties.

As illustrated above, these wires are woven with a triple warp and a single shoot wire.

The triple warp wires can be woven to fit any paper-making machine, but are generally used on the smaller machines.

Prompt deliveries can be made on all meshes of Tyler Fourdrinier, Cylinder and Washer Wires. In many instances shipment can be made from stock, including the Tyler Special Wires and the regular No. 60, 65, 70, 75 and 80 Wires.



The W. S. Tyler Company

Cleveland, Ohio

Manufacturers of Fourdrinier Wires, Cylinder Faces, Washer Wires, Corduroy Cloth, Backing Wires

The Ordway-Yaryan Evaporator

Save 20% to 40% of the steam now used by the evaporator

If you use a triple effect evaporator add two effects and save 40 per cent.

If you use a quadruple effect add one effect and save 20 per cent of the steam.

Present price of coal warrants the installation.

The MALONE BLACK LIQUOR FILTER saves pulp, evaporator cleaning, foaming and repairs.

CHARLES ORDWAY
25 Church St. New York City
Successor to The Yaran Company

JENSSEN ACID TOWERS
at Nekoosa Edwards Paper Co.
Port Edwards, Wisconsin

62 Jenssen Tower Installations

GREAT ECONOMY has been effected in mills where the

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Sixty-two Installations now in operation or building

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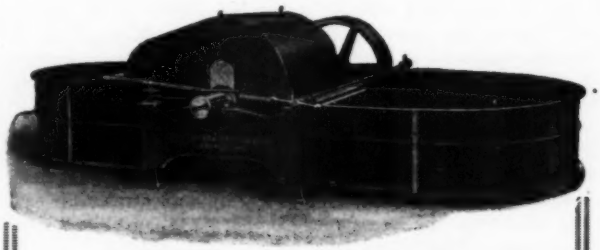
PAPER CUTTERS

Single, Duplex, and Diagonal

CUTTER KNIVES
PATENT TOP SLITTERS

Hamblet Machine Co.
LAWRENCE, MASS.



"Dayton" Beating Engines are Built for Heavy Duty

Dayton Beater and Hoist Co.
DAYTON, OHIO

Sutherland Paper Co.'s Mill About Complete

Kalamazoo's eighteenth paper mill will be in operation in April when the new board mill of the Sutherland Paper Company begins production. The Sutherland plant will be in every way a creditable addition to the big concerns that combine to make Kalamazoo "America's first paper city."

The structure is located immediately north of the company's carton plant. It is designated and equipped for the manufacture of high grade, light weight butter carton board, with a daily output of 40 tons. It is the announced intention of the Sutherlands to use the entire product of the new mill in the company's conversion plant.

The Sutherland Paper Company, having sold its parchment equipment to the Kalamazoo Vegetable Parchment Company, has been able to transform all that space, some 30,000 square feet, into the manufacture of butter cartons. A large amount of new machinery is now being installed. It is all special equipment, being designed at the plant and built especially for the company's own use. The concern is now completing plans for the manufacture of a new type of butter carton, superior to any carton on the market at this time. When the improvements to the conversion plant are completed, the daily output will be 1,500,000 finished cartons, or 450,000,000 a year.

In connection with the great enlargements to this industry, President L. W. Sutherland states that moves are being made that will greatly increase the welfare of employes. A large room, formerly used as a box shop, has been transformed into a comfortable welfare hall. Here hot luncheons are served at noon. Motion picture programs are given three times each week and a victrola has been secured to furnish dance music. Special feature programs will be given from time to time.

It is also the intention to acquire several acres of land immediately adjoining the mill site. This will be generally improved and converted to park purposes for the use of employes and nearby residents.

Monroe Paper Products Meeting

The annual meeting of the Monroe Paper Products Company, Monroe, Mich., was held Tuesday, March 1. At the meeting the officers for the year were elected.

The work at the new mill is progressing rapidly. All the machinery, with the exception of the board machine, has been received and is being installed. The new mill will open early this summer.

Paper Companies Buy $2,000,000 Timber Tract

Five paper mill companies of the state of Michigan, which have been increasing their timber holdings in the Upper Peninsula, have just bought 10,000 acres of virgin timber land in Gogebic, Ontonagon and Iron counties, from the J. C. Ayer estate. The price is said to have been $2,000,000. The tract, known as the Old Military Roads Land, was granted to various road construction contractors by Congress in 1863, to aid in the construction of a military wagon road from Fort Wilkins, at Copper Harbor, to Houghton and Portage Lake, thence south to the Wisconsin border and Fort Howard, at Green Bay, Wis.

Enormous shipments of pulpwood are arriving at Appleton Junction daily. Under normal conditions during shipping seasons pulpwood receipts there amount to from 30 to 40 carloads a day, but at present the number has increased to from 130 to 150 carloads. Most of the wood comes from northern Wisconsin and Minnesota. The value of the pulpwood now on hand is estimated at millions of dollars.

It is announced that the new $1,000,000 dam of the Escanaba Paper Company, in the Escanaba river, and the enlargement of the mill to double its present capacity, has been completed.

BAILEY FLUID METERS
CUT STEAM WASTE

and give reliable, comprehensive information to those whose interest is centered in efficiency and operating costs.

Bailey Fluid Meter—Type C2, Class 24

Three kinds of correlated information are shown on chart.

1—The rate of steam flow
2—The steam pressure
3—The steam temperature

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Manufactured by
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MAKERS OF
Fine Felts for Fine Papers
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WISCONSIN WIRE WORKS

ALL MESHES OF PAPER MAKING *Wire Cloth*

APPLETON WISCONSIN

Fitchburg Duck Mills
ESTABLISHED 1844
FITCHBURG, MASS.
MANUFACTURERS OF
STANDARD AND MULTIPLE
DRYER FELTS
English Weave in Two, Three, Four, Five and Six Ply—60 Inches to 176 Inches in Width

Fine Faced Felts for Fine Papers. Absolutely no felt marks in paper. TRIBUNE Three Ply Felts for Coarse Papers.

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Claflin Continuous Beaters
Have 3½ times the efficiency of other beaters in use today for Beating, Brushing and Refining Paper Stock?
For Increased Production, Greater Economy, Stronger, Finer, More Uniform Pulp, the CLAFLIN CONTINUOUS BEATERS will more than satisfy.
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The Canadian Fairbanks-Morse Company, Limited Agents for Dominion of Canada.

James N. Mohr Dies

James N. Mohr, former vice-president and general manager of the Reading paper mills, died at his home in Philadelphia, Pa., on February 15. He was 76 years old.

Mr. Mohr was born at Nohrsville, and came to Philadelphia at the age of 16. Later he moved to Omaha, but returned in 1875 and became associated with the late George F. Baer as sales manager of the Reading mills. He rose to the vice-presidency and held the position of general manager until his retirement eight years ago.

Heads Paper Mill

Cyrus E. Frye, of Elkhart, Ind., was elected president of the Lincoln Paper Mills, succeeding the late Edward B. Zigler. Arthur E. Zigler was elected secretary to succeed S. B. Monroe, who resigned. The company is capitalized for $1,000,000.

The Fort Howard Paper Company of Green Bay, Wis., has installed a second paper machine, which will double the capacity of that city's newest paper manufacturing plant. The new machine will turn out twenty-five tons of tissue paper or from 1,200 to 1,400 cases every twenty-four hours. Enlargement of the plant is contemplated this spring.

The Pride Pulp and Paper Company, Tomahawk, Wis., has filed amendments to its articles of incorporation, to increase its preferred stock from $700,000 to $1,200,000. The common stock consists of 7,000 shares of no par value. The stock will be issued as required.

It is reported that the Midwest Box Company of Delaware has been formed with a view to consolidating the subsidiary interests involved to take over the business of the American Strawboard Company, the Midwest Box Company of Indiana, the Midwest Box Company of Ohio and the Midwest Box Company of West Virginia. Capital stock of new company will consist of $7,500,000 preferred stock, par $100, and 75,000 shares of common stock of no par value.

The large paper mills of the Robert Gair Company, in Quincy, Ill., formerly the Weis mills, manufacturers of straw and chip board, have resumed operations.

Due to the splendid progress which was made in making a number of necessary repairs at the Yellow Pine Paper Mill, Orange, Texas, recently, the plant has again resumed operations.

Articles of incorporation of the Paper Products Company, Dubuque, Iowa, have recently been filed. The incorporation is for a period of twenty years, beginning March 1, with a capital stock of $21,000.

Earnings Estimated at $17,000,000

It is reported that while the annual report of the International Paper Company is not expected to be published until the latter part of this month, unofficial estimates of the 1920 figures place net earnings, after allowance for taxes, at approximately $17,000,000. It is claimed ordinary depreciation will be carried at $2,000,000 and charge-off for depreciation of inventory will amount to $5,000,000, making a total deduction of $7,000,000 from net.

On the basis of estimated earnings, deducting approximately $500,000 for bond interest and $1,500,000 for dividends on the preferred stock, would leave in the neighborhood of $8,000,000 available for the common stock. This would be equivalent to $40 a share on the $198,039 shares of common stock outstanding. This compares with net, after taxes and interest, available for the common stock of $2,621,494, equal to $13 a share, for the 1919 fiscal year.

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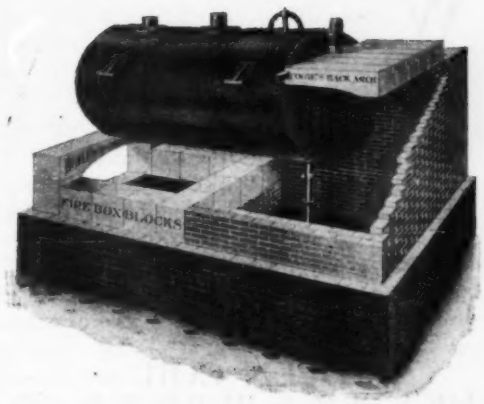
The Enduring and Efficient Boiler Setting Material



"Steel Mixture" is a hard, tough and extremely refractory material, whose composition enables it to resist abrasion and fusion to a high degree.

The unusually large size of the arch and lining blocks and their tongue and groove construction reduce the possibility of defective joints and the chances for clinkers to impair the service and life of this lining.

Its air-tight structure insures more efficient combustion. Installation costs are decreased and repair charges are negligible.

Seven blocks will form a double door-arch; ten blocks, a fire-box lining; twelve pieces a back combustion chamber arch—and the blow-off pipe protectors can be laid in ten minutes.

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Gentlemen:
Please send, without obligation, your new catalog on "Steel Mixture" and your Dimension Booklet covering items checked below.

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The Stickle Automatic Steam Control for Paper Machines

WE wish to emphasize the word "automatic." This with us means that the steam follows changes that come to the sheet from free to hard drying stock or any ordinary changes in weights. A control that does not do this in itself is not automatic. This makes a better sheet of paper. We guarantee to hold the moisture at any point you wish with ½ of 1% change. Furnished on 60 days' approval.

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Ball Engines

Are now built in

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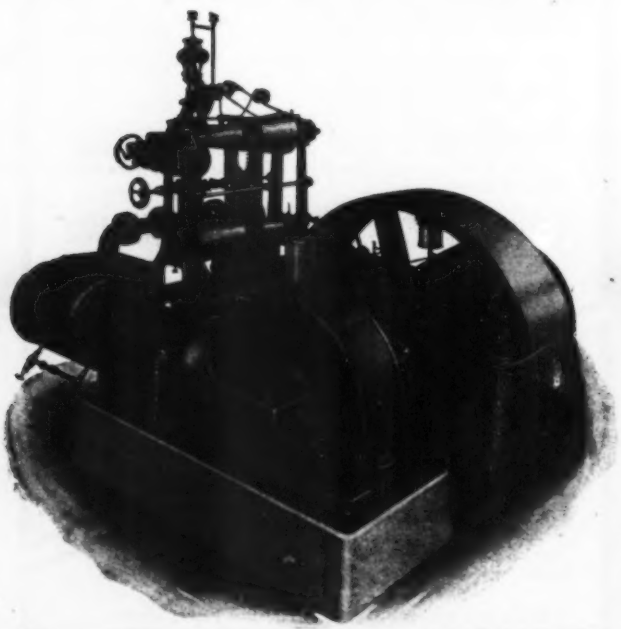

Variable Speed Engine

The engine illustrated above is especially designed to drive paper machines, giving continuous and reliable service. A patented safety device protects your employees and plant.

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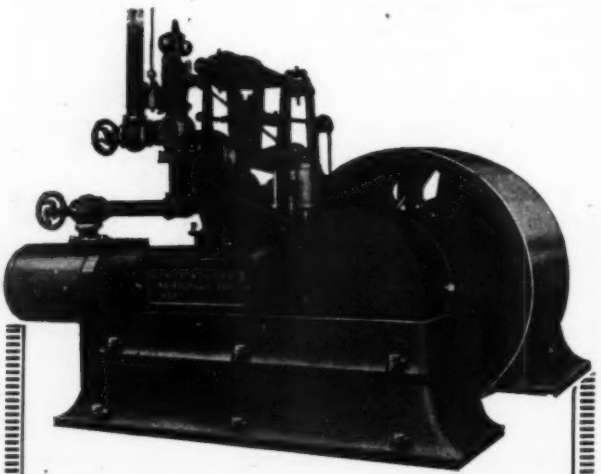

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Paper Mill Economy is assisted very materially by the installation of High Grade Variable Speed and Constant Speed Engines.

Send for List of Installations and Catalogs

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Indianapolis, Indiana.

Newsprint Prices Revised Again

The International Paper Company has announced another revision in prices for delivery in the second quarter of the year. The new price will be 5.5c a pound, compared with 5.7c announced recently. The company adjusts its prices quarterly, but a short time ago, when the 5.7c price was fixed, consumers had the option of accepting 5.5c for the last three quarters of 1921. The new price will be only for the second quarter.

The Kennedy Paper Mills, Inc., of Broadalbin, N. Y., has filed schedules in bankruptcy, with liabilities of $32,817 and assets of $36,780, consisting of real estate in Broadalbin, N. Y., $35,000; insurance of paper mill, machinery, etc., $10,500, and stock, $1,280.

Newton Falls Mill to Be Completed Soon

The new plant of the Newton Falls Paper Company, now controlled by the McGraw Hill Company and the United Publishers' Corporation of New York, will be completed the coming spring and ready to turn out high grade book paper.

Development of the water power is to be undertaken to utilize the full head.

The mill will have a capacity of forty-five tons of paper daily. The extension of the plant to make this possible includes erection of a new machine room of modern construction, steel and concrete, a new wood cutting mill and a large bleacher building. Much of this extension has already been finished. A new acid system and bleacher was included in the innovations and new machinery has been added, including extra presses, screens, supercalenders and more cutters in the finishing department.

These extensions call for a larger force, and as Newton Falls is practically a mill village, the company was called upon to provide housing facilities. A two-story frame dormitory with a capacity of fifty persons, and several two-family houses were erected last year.

A. W. P. Co. Gets Big Order

The American Writing Paper Company has recently secured contracts with government for about 8,000,000 pounds of paper product, being low bidder on forty-nine items. The work will begin immediately and will be distributed among six or seven of the mills of the company, with the greater part of the business remaining in Holyoke.

Hanna Co. Increases Capital Stock

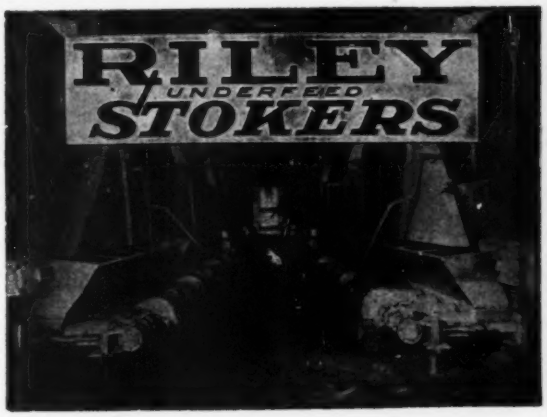
Following a special meeting of the stockholders of the Remington Paper and Power Company, Inc., held in Watertown on February 22, there was filed March 1st with the secretary of state in this city a certificate authorizing an increase of capital stock from $300,000 to $2,500,000. The papers as received in the secretary of state's office bore the signatures of C. H. Hanna, vice-president, and R. H. Maltby, secretary.

The company will hereafter be known as the Hanna Paper Corporation.

The Remington Paper and Power Company was organized about five years ago, while Francis M. Hugo was secretary of state, Mr. Hugo having been treasurer of the old Remington & Martin Company, which with the Raymondville and the Norwood paper companies was taken over by the Hanna group, which it is understood paid approximately $1,500,000 for the common and preferred stock of the consolidated companies.

Howland Pulp & Paper Co. Merged

Merger of the Howland Pulp & Paper Company of Howland, Maine, and the Advance Bag Company of Middletown, Ohio, is announced by an official of the Howland company. The entire product of the Howland plant will be used by the Middletown factory.



Firing that is Different

WITH the RILEY STOKER the coal is fed—the fire cleaned—the ash discharged, ***continuously*** and ***automatically***. All done without waste or effort, efficiently and economically.

It is not only the things the RILEY STOKER does but the way it does them. For instance, when steam is wanted quickly, and time is precious, you can get this steam instantly and economically by increasing the motion of the grates.

With the first turn of the cranks the grates start moving—the whole fuel bed is thrown into action. There is no watching nor waiting—poking nor slicing—the stoker responds instantly and in two or three minutes the boiler will be operating at 200 or 250% of rating.

It is this kind of flexibility that saves not only for the central station but for the industrial plant.

Catalog D-3 sent on request

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Boston New York Philadelphia Pittsburgh Buffalo
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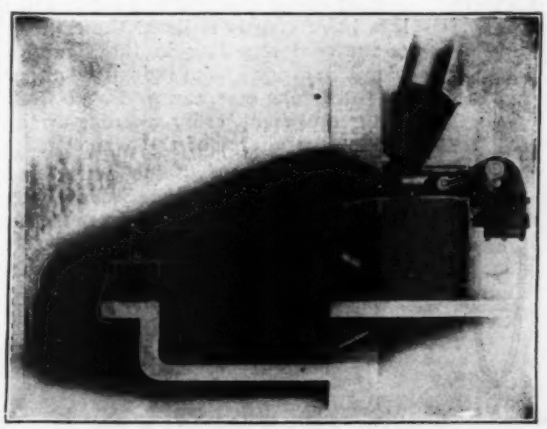

New Sand Filter

A SPECIAL filter for paper mills, producing all the results the paper manufacturer desires. It is a modification of the well known Hungerford filter adapted to paper mill use. It is constructed of concrete, strictly wrought iron pipe, brass strainers and especially prepared silica sand. It is as durable and efficient as can be built at any cost. It can be sold at a very low figure.

This filter gives perfectly clear water, washes thoroughly, does not require renewal of the sand bed, is absolutely reliable in the performance of its duty and requires a minimum amount of attention.

Send for full particulars

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Originators and Oldest Manufacturers
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Cast Bronze Screen Plate
ALSO SPECIALIZE IN
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MANUFACTURERS OF
WARREN IMPROVED CALENDER DOCTORS
With Flexible Blades, Universal Adjustment and Control
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WARREN IMPROVED PATENT DOUBLE DRUM WINDERS
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Stock Circulating Systems *and*
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SEND FOR OUR BULLETIN

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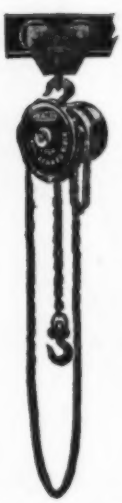
Cut Down *Your* Handling Costs



ONE man moving with ease a load that formerly took all the energies of five men—that's worth your thought, isn't it?

Yale Chain Blocks and I-beam Trolleys have greatly reduced the expense of material handling in thousands of plants in every line of industry—either by permitting one man to do the work of three to eight, or by speeding up the productive efforts of the whole gang.

Yale Spur-geared, Screw-geared and Differential Chain Blocks and Yale Electric Chain and Electric Wire Rope Hoists are made in all required sizes. Complete descriptive catalog sent on request.

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SPUR-GEARED BLOCK

UNION SCREEN PLATE CO.
Fitchburg, Mass., U. S. A. Lennoxville, P. Q., Canada

UNION BRONZE SCREEN PLATES
(Best phosphorized Cast Metal)
Old Plates RECLOSED and RECUT to accurate gauge
UNION BRONZE SCREWS for Screen Plates
Immediate Delivery of the Largest Orders. Satisfaction Guaranteed
The Witham Screen Plate Fastener, Patented
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SCREEN PLATES *and* DANDY ROLLS
Watermarking a Specialty
Central Manufacturing Co.
The Quick Service House
KALAMAZOO MICHIGAN

Has $200,000 Capital

Articles of association have been filed with the secretary of state by the National Pulp Wood Corporation of Rutland, Vermont, organized to purchase, acquire, cut, take and manufacture all manner of trees, timber, wood and underwood and the products thereof and to deal in all manner of fiber suitable to be used in the manufacture of paper, also to construct such buildings, dams, etc., as may be needed in this work. The company is capitalized at $200,000, divided into 2,000 shares. The incorporators are Perley R. Eaton, Gene J. Eaton and Mary E. Quigley, all of Rutland, and Edward P. Cleary of Dillery, Province of Quebec.

Peerless Paper Co. Elects Officers

At the annual meeting of the stockholders of the Peerless Paper Company, Dayton, Ohio, the following officers were elected: G. H. Mead, chairman of board; A. L. Rieger, president and general manager; Albert Herzing, vice-president; L. P. Rieger, secretary-treasurer; R. E. Pohl, comptroller and assistant secretary; M. G. Benson, supervisor of purchasing and traffic department, reappointed.

Directors names are: A. L. Rieger, L. P. Rieger, R. T. Houk, W. N. Hurlbut, G. H. Mead, Louis F. Berk, all of Dayton, and Albert Herzing, St. Marys, Ohio.

New Personals

Leon Gottheil, of Castle, Gottheil & Overton, pulp and papermakers' supplies dealers of 200 Fifth avenue, New York, is taking a vacation of several months in California, and is expected back in New York about the first of April. Mr. Gottheil recently was elected president of the Association of American Wood Pulp Importers.

Wilfred Graham, for some years connected with the Union Card and Paper Company, of New York, has entered business on his own behalf under the name of the W. Graham Company, with offices at 200 Broadway, New York. He is making connections that will enable him to offer several well established mill lines.

Jacob Kindelberger, president of the Kalamazoo Vegetable Parchment Company, Kalamazoo, Mich., and one of the most widely known paper men in the Middle West, sailed from New York on the steamer Aquitania February 28 for Europe, where he expects to make a careful study of market conditions. Mr. Kindelberger's itinerary includes England, France, Belgium, Norway and Sweden, and he will remain abroad until about the middle of April.

Leonard F. Hicks, vice president of Daniel M. Hicks, Inc., importers of and dealers in papermakers' supplies at 200 Fifth avenue, New York, was married on February 12 to Miss Antoinette Bond, of Newport, Ark., the ceremony being performed in the Waldorf-Astoria Hotel, New York, in the presence of a few relatives and friends. Mr. Hicks and his bride went to Bermuda on their honeymoon.

After having been connected with Bird & Son, roofing felt and box board manufacturers of East Walpole, Mass., for thirty years, George M. Graves has resigned as purchasing agent of that concern and will shortly enter business as an importer and dealer in papermakers' supplies after his return from a trip to Europe. Mr. Graves will open offices in Boston and his firm name will be the George M. Graves Company. Allan H. Russell has succeeded him as purchasing agent for Bird & Son.

The Continental Paper Bag Company, a Maine corporation, has changed its name to the Continenal Paper and Bag Mills to conform with the recent change in name of the New York corporation of the same title.

Perforated Metal Screens

in all metals for pulp and paper mills

Elevator Buckets (Plain and Perforated)

Conveyor Flights and Trough

General Sheet and Light Structural Work

Write for perforated metal handbook

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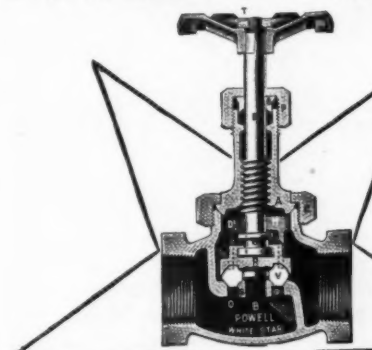

DOUBLE-LIFE DISC of non-corrosive white "POWELLIUM"

SLIP-ON Disc Carrier protects the unused face of disc

Exclusive claims to SUPERIORITY of the "WHITE STAR" VALVE

Ask your dealer for Powell Valves or write us

The Wm. Powell Company
Cincinnati, Ohio

EASTWOOD Wire Mfg. Co.

Fourdrinier Wires
Cylinder and Washer Wires

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WE ALSO MANUFACTURE

Valves, Unions, Cocks, Fittings, Digester Parts, Castings, etc., for Sulphite Mills from Our Perfection Bronze

THE NEWPORT COLORS *for Paper*

We are manufacturing an extensive range of high-grade products for the paper maker. We particularly call your attention to our

Newport Azo Eosine G

which is a very bright acid pink. It is faster to light and is more economical than basic eosine. We will be pleased to supply further information.

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Newport Chemical Works, Inc.
DELAWARE CORPORATION
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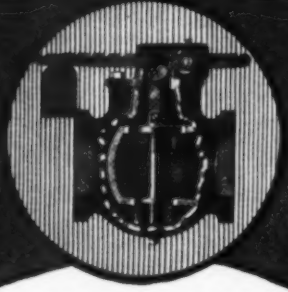


Dependable Back Pressure Regulation for Paper Mills

The Davis Back Pressure Valve maintains any desired back pressure on the exhaust line of a non-condensing engine. Dependable as gravity because back pressure is maintained by a counter weight on a lever arm.

Valve is of unfailing double piston type—noiseless—will not stick nor bind due to construction of valve and seats that effects even expansion of metals.

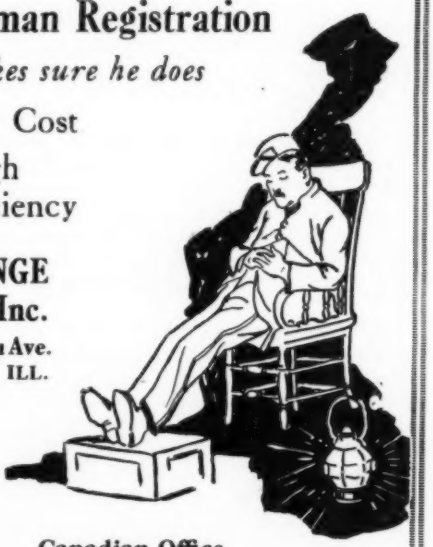
The Back Pressure Valve is just one of the Davis appliances that have been saving steam for paper mill operators since 1875. A catalog full of steam-saving data tells about them. Write the G. M. Davis Regulator Co., 414 Milwaukee Ave., Chicago.

DAVIS VALVE SPECIALTIES
STEAM SAVERS SINCE 1875

Does He Really Watch?

HARDINGE SYSTEM *of* **Watchman Registration**
makes sure he does

Low in Cost
High
in Efficiency



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HARDINGE BROS. of CANADA, Ltd.
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A Valuable Book

Paper mill advertising managers and everyone connected in any way with the service which enters into the production of printed matter, and all its branches, will find a wonderful help in a new book which has just been published, entitled "Commercial Engraving and Printing."

Thirty-five separate subjects—practically all of them of vital importance to the business man who either buys or sells engraving, printed matter, or any of the materials, service or equipment that enters into their production—are thoroughly and comprehensively covered, not in a technical, but in a practical way. The chapter devoted to Paper contains forty-eight pages of a brief non-technical article, covering with complete thoroughness the general features in the manufacture of this product. Each section of the book is a different kind of paper with its name, size and weight indicated thereon. By reference to these sections, the adaptability of different qualities of paper to certain grades of printing can be readily seen.

There are 850 pages in the book, and over 1,500 illustrations, all numbered, and explanatory notes tell from what kind of copy and how each was made, thus explaining almost every conceivable treatment. Bound in heavy buckram, in one desk-size volume, and containing a complete index, it becomes invaluable as a quick reference. The Commercial Engraving Publishing Company, Indianapolis, Indiana, are the publishers.

The Gray Terror

Through the courtesy of the Canadian Pulp & Paper Association, we are in receipt of a clever little story by Secretary A. L. Dawe, entitled, "The Gray Terror," which pictures some of the situations that might arise in our complicated civilization were articles made of paper to be suddenly destroyed.

The R. G. Smith Tool and Mfg. Co. announce that they have moved from 315 Market St., into their larger factory at 245-247 N. J. R. R. Ave., Newark, N. J., where they will engage on a larger scale in the manufacture of their recently developed "Standard Radius Lathe and Planer Tool." Each set includes the excellent Smith "Cuttingoff tool" and threading tool. They are also fully equipped for the making of special tools, moulds, dies, jigs, gauges, and fixtures.

The Industrial Research Department of the Hercules Powder Company, formerly located in the Finance Building, Philadelphia, Pa., has been moved to the company's general offices in the Delaware Trust Company Building, Ninth and Market Streets, Wilmington, Delaware, to which address all correspondence should now be directed.

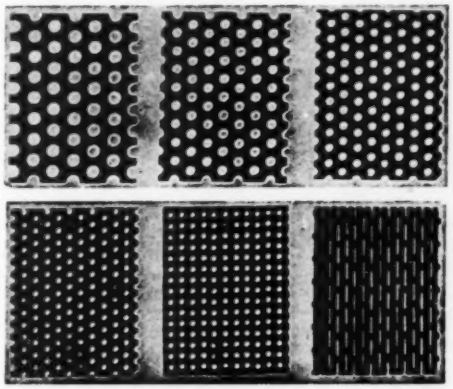
The Bacharach Industrial Instrument Co., of Pittsburgh, Pa., announce the purchase of a new building at Homewood Station, Pittsburgh, where, by the addition of 18,000 sq. ft. floor space, their facilities for giving prompt and efficient service has been considerably increased.

The products handled by the company consist mainly of Gas Meters, Air Meters, Pressure Recorders, Draft Recorders, Pilot Tubes and Orifices, CO_2 Indicators, Manometers, and Engine Indicators.

The Poland Paper Company announces the opening of its general sales offices in Suite 1168-1170 of the Fifth Avenue Building, 200 Fifth avenue, New York. The general selling force was formerly located at Mechanic Falls, Me., where the mills of the company are situated.

At the annual stockholders' meeting of George W. Millar & Company, paper merchants of 284 Lafayette street, New York, recently, Charles J. Roeser was elected to the board of directors to fill an existing vacancy.

Perforated Metal Screens



Of Copper, Brass, Steel, Bronze, or Any Other Metal

Perforations of All Sizes and Shapes for Use in Pulp and Paper Mills in

Centrifugal Screens, Drainer-Bottoms, Filter Plates, Pulp Washers, Suction Box Covers, Etc.

Accuracy in all details and excellence of quality at lowest consistent prices

The Harrington & King Perforating Co.

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NEW YORK OFFICE, 114 LIBERTY STREET

Pure Drinking Water

Keeps Workmen Healthy

Physiologists agree that in order to keep the body in a normal state of health, a man should drink the equivalent of not less than seven glasses of water each day. Pure drinking water is a primary requisite for hygienic living and helps to keep the body free from all intestinal disturbances.

Stimulate the efforts of your employes and save their time in going to inaccessible hydrants by piping clear, cold water to them by means of Milwaukee's

"Famous" Cooler Fountains

This fountain includes a barrel of 1¼" thick oak, painted outside; cover of double thickness; galvanized pipe coil through which water passes to drinking head without coming in contact with ice, and a heavy vitreous china bowl with either cast brass bubbling head with self-closing stop or "Vertico-Slant" stream from which glass can be readily filled.

RUNDLE-SPENCE MFG. COMPANY

MILWAUKEE *Write for Catalog* WISCONSIN

The CHICAGO
Approved Portable
WATCHMAN'S CLOCK

with its special Waltham movement, its lock stations and its superior quality throughout, is especially desirable for mills and factories and for either in-door or out-door patrol.

Write for booklet.

CHICAGO WATCHMAN'S CLOCK WORKS
9 Church Street, NEW YORK
1528 South Wabash Avenue, CHICAGO

Hamilton Top Felts

run until worn out, with less trouble of "picking" on machine than any other make of top felts can show. A trial is invited

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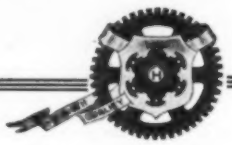

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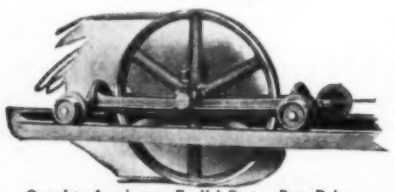
You know your business from "A" to "Z" and we know transmission engineering—at least we should—as we have been at it for thirty-seven years.

Combining your knowledge with ours, when a power transmission machinery equipment is to be laid out, or a friction clutch is to be installed, will insure the correct solution and a perfect installation.

Have your power transmission problems solved by our engineers. Their service is absolutely free and places you under no obligations.



Complete American or English System Rope Drives

We manufacture a complete line of efficient power transmission machinery, including the well known Hill Friction Clutch (Smith Type) and Hill Collar Oiling Bearing. Catalog and bulletins upon request.

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New York Office, 50 Church Street

FOR SALE

2—1800 lb. Brand New Beaters, never installed, Rolls 61"x48", immediate delivery. For detailed specifications and prices Address Box 1075, c/o The Paper Industry.

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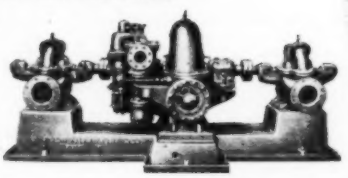
For Service Where Quality Counts



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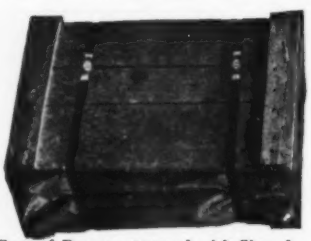
SIGNODE SYSTEM



Framed Reams, strapped with Signode System

Signode straps insure delivery of framed paper bundles in the same condition they leave the mill. Cheaper than rope. No battered corners. Liberal trial arrangement.

Write for Particulars and Prices

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564 W. Adams Street CHICAGO, ILL.

"NORTHERN" Cranes and Hoists
Northern Engineering Works Detroit, Michigan

The Lagerloef Trading Company, Inc., of 18 East Forty-first street, New York, wood pulp importers, sole agents for the Finnish Cellulose Association and the Finnish Wood Pulp Union, has opened a branch office on the nineteenth floor of the Conway Building in Chicago, with R. E. Krudener in charge.

E. M. Sergeant & Company, wood pulp importers of New York, have increased their capital from $80,000 to $92,000.

The Alert Booklet

Hardinge Brothers, Inc., of Chicago, have issued an unusual booklet, which describes the Hardinge ALERT Watchman's Clock System. The ALERT book is a novel departure from the ordinary catalog—in fact, it can hardly be classed with catalogs. It is different and much more interesting.

The all-important problem of plant and equipment protection is discussed and the necessity for a dependable means to check watchmen is presented in a very convincing manner. The unique illustrations picture graphically the value of this mechanical protection against human frailty. We should say that anyone employing a watchman or a number of them will be interested in this book.

The Management Engineering and Development Co., Dayton, Ohio, have issued an impressive booklet in which are reproduced some concrete evidences of their successful accomplishments in designing and constructing paper and pulp mills. The Management Engineering and Development Co. is organized to design and construct complete plants for the manufacture of the many different grades of pulp and paper, together with hydro-electric and steam power development. The company is also equipped to operate any unit or units designed and constructed by them, as well as other plants that are at present in operation. Their slogan is: "Engineering and Design by Operating Engineers."

Conveyors Corporation Doubles Factory Force

The steady increase in business of the Conveyors Corporation of America, formerly American Steam Conveyor Corporation, Chicago, has necessitated doubling the number employed in their South Bend, Indiana, plant. The Conveyors Corporation manufacture the American Trolley Carrier and the American Steam Ash Conveyor.

Vernon Brothers & Company, of 66-68 Duane street, New York, one of the largest paper jobbing concerns in the East and also one of the oldest, if not the oldest, in the country, has just celebrated the eightieth anniversary of the founding of the firm in 1841. In commemoration of the event, the company sent out engraved greeting cards to the trade announcing its pleasure and pride in the fact that it was celebrating its eightieth anniversary and thanking its customers "for the friendship of three generations," and expressing deep appreciation of the value of the good will of friends both old and new.

Dwight P. Robinson & Company, Incorporated, a large firm of engineers and constructors of New York, has recently opened branch offices in Montreal in the Dominion Express Building. Alexander C. Barker, Vice-President, is in charge of the office. The company is a consolidation of Westinghouse, Church, Kerr & Co., Inc., and Dwight P. Robinson & Co., Inc., and has done extensive construction and engineering work in Canada for the Canadian Pacific Railway, Canadian Salt Company, Canadian Crocker-Wheeler Co., Dominion Government, Aetna Explosives Company, Grand Trunk Railway and others.

The Owyhee Chemical Products Company of Chicago, producers of "Wilkinite," the new loading material, through their sales representatives, Williams Commission Co., beg to announce that they have appointed Mr. Cale B. Forsythe, Kalamazoo, Michigan, as their exclusive representative to the Paper Industry.

The Combustion Engineering Corporation, New York City, have distributed a very handsomely arranged calendar, starting with the month of February and carries through the month of January, 1922. The sheet for each month contains an illustration of one of their four types of stokers: Type E, Goxe, Type H, and the Lopulco Pulverized Fuel System.

335,000,000 Cubic Feet National Forest Timber and Pulpwood for Sale

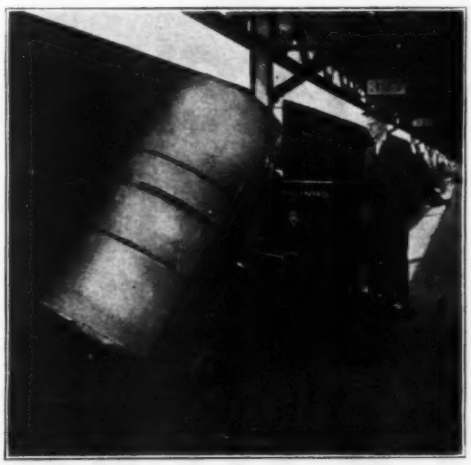
LOCATION AND AMOUNT—All the merchantable dead timber standing or down, and all the live timber marked or designated for cutting on an area embracing about 150,000 acres on the west side of Admiralty Island, extending from Young Bay on the northeast side of the island across to the head of Hawk Inlet, and thence southerly along the west side of the island to Kootsnahoo Inlet and Mitchell Bay, Tongass National Forest, Alaska, estimated to be 335,000,000 cubic feet, approximately equivalent to 3,350,000 cords, more or less, of Sitka spruce, hemlock and other species of timber, approximately 85 per cent hemlock.

STUMPAGE PRICES—Lowest rates considered, $.60 per 100 cubic feet for Sitka spruce and Alaska cedar and $.30 per 100 cubic feet for hemlock and other species. Rates to be readjusted every five years.

DEPOSIT—With bid $10,000, to be applied on the purchase price, refunded, or retained in part as liquidated damages, according to the conditions of sale.

FINAL DATE FOR BIDS—Sealed bids will be received by the District Forester, Portland, Oregon, up to and including June 30, 1921.
The right to reject any and all bids is reserved.
Before bids are submitted full information concerning the character of the timber, conditions of sale, deposits, and the submission of bids should be obtained from the District Forester, Portland, Oregon, or the District Forester, Ketchikan, Alaska.

A REAL Solution to Newsprint Handling



Picks up from either horizontal or vertical position a 72" roll or its equivalent in small rolls.
Stacks on end in car or warehouse.
Easy and simple to handle and will operate all day on a 25-cent charge of electricity.

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The Elwell-Parker Electric Company
"Pioneer Builder of Electric Industrial Trucks"
Cleveland, Ohio, U. S. A.

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Machine Finish and Super Calender White and Colored Book
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made entirely from spruce grown on our own timberlands in northern Maine.
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WOLVERINE Paper Company
"Wolverine" Waxed Papers for Every Requirement
Best Quality
Waxed Tissue a Specialty
OTSEGO, MICHIGAN

CONTINUED readjustment of prices on lower levels has featured the paper market during the past several weeks. There is nothing sudden and spectacular in the course which the industry is now taking. The shrinkage in values had to come and was expected by a great majority of those connected with the manufacturing and distributing of paper, and it is commonly recognized by leaders in the industry that the broad changes that have occurred and are still in process of development will in due time make for a healthier and livelier market situation.

Activity in the paper trade has been of unusually narrow compass. Not in a long time has demand been quite so limited, and the dull condition in paper consuming circles has been clearly reflected at producing centres, where mills in numerous cases have closed down temporarily, while those that have continued operating have greatly curtailed running schedules. Rather than keep producing paper for which at present there is no consuming outlet, manufacturers have wisely reduced their output for a time, feeling that this is the better policy to pursue under prevailing circumstances. This in itself is an encouraging sign because it means that when market activity revives there will be no heavy stocks of paper at mills or in jobbing establishments to weight down the market and to prevent matters from taking their proper course.

Paper is a commodity that is equally as necessary to the public in these modern times as are foodstuffs and clothing. It therefore stands to reason that demand cannot long remain as quiet as it has been during the past several months. Once business in other lines improves, and demand for paper of various kinds must broaden in proportion. The best indication that a better market condition is not far off is the increased life visible in other industries on which sellers of paper depend in large measure for an outlet for their product. True, there is scarcely a commodity market today which is in a normal condition in point of business being transacted, but in numerous directions proof is not wanting that matters are improving, and it seems only a question of a short while longer when business generally will assume something like a normal status. In the meantime, the paper market should gradually undergo improvement along with others and should in due time exhibit at least average activity.

February was a decidedly dull month for the paper trade. Some increase in business was noted in certain grades of paper, but as a whole the market ruled exceedingly quiet. Buyers have continued to operate solely in hand-to-mouth fashion, coming into view only when immediately and actually in need of supplies, and the aggregate demand for paper and paper board of all kinds has been insufficient to even begin to keep mills busy. Prices have been constantly on the down-trend, and this, as would be expected temporarily, has served to make consumers hold off in absorbing supplies. It is against human nature to buy on a declining market, and the user of paper is not different from consumers of other manufactured articles. In some instances, appearances would seem to indicate that real low levels have been reached by paper prices beyond which it is impossible to go if manufacturing is to be maintained. It is a fact that prices on certain kinds of paper and board are below the prevailing cost of production, and although this situation can be temporarily, it cannot last. It is significant, too, that it is in those parts of the industry where manufacturers, instead of adjusting their output for the time being in proportion to the demand for their product, have continued running their plants at full or close to full capacity that prices have fallen to such drastic levels. That adage about "competition being the life of trade" is a true one, but there are times when manufacturers of any article—paper not excepted—can disorganize and destroy their own trade through competition.

This situation has prevailed particularly in the box board branch of the industry. Board mills in the East, in their efforts to secure enough orders to keep operating full, have repeatedly reduced quotations until prices on some kinds of board have gone down to what is considered actually under the present cost of manufacturing. Paper manufacturers in most cases have purposely curtailed their production during the dull period in relative proportion to the decrease in demand for their product. The average paper mill today has fair-sized stocks of finished paper, but all indications are that there is no large surplus stored up; and it stands to reason because of their extremely cautious buying in recent months that jobbers have but light amounts of paper on hand. Let consuming trades display a little more life and paper buyers begin to operate more freely and the entire paper industry should quickly undergo improvement, because retailers, wholesalers, mill agents and manufacturers should at once feel the stimulus of increased demand.

Probably the most important development in price fluctuations has been the reduction in the contract basis of news print by leading producers. The International Paper Company has announced a price of 5.70 cents per pound, or $114 per ton, f. o. b. mills to contract customers for the second quarter of the year, compared with a price of $130 per ton for the first quarter. Other news print manufacturers in this country and in Canada have made proportionate reductions. The spot market for news print displays an easy tone, with fairly large tonnage offered at 5.50 cents, and with sales in some instances reported down to 5 cents.

Book papers are again on a lower price basis. Machine finished book is quoted in the open market at 10 cents a pound and less, super book at 12 cents and coated book at 13 cents. Coarse papers have moved lower, and No. 1 domestic kraft wrapping is quoted at 8 cents and No. 1 white tissue at $1.75. Fine papers are gradually easing off in price. Low quality sulphite bonds are available at as cheap as 14 cents per pound and rag bonds are available at down to 16 cents.

Plain chip board has sold in the East at as low as $30 a ton and filled news board at $32.50 at mills, although the bulk of business done in board has been at slightly higher quotations.

In recognition of his long and faithful service with the company, the J. E. Linde Paper Company, paper jobbers of New York, have announced the appointment of A. C. Wetmeyer as manager of the firm's home office. Mr. Wetmeyer started with the Linde Company 26 years ago, and by conscientious effort and strict attention to business worked his way up to the head of the book and cover paper department. He has acted as buyer for this department for the past 20 years and will continue in this capacity in addition to his new duties.

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Write or Wire for Samples and Quotations

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Relieving the Shortage of Raw Materials

Out of the forty different kinds of paper stock graded in our many large warehouses, you are assured a steady, reliable source for procuring raw materials in practically every branch of paper making.

Having specialized for 35 years in this one field you can depend upon a clean, well-packed, uniform product throughout; fulfillment of delivery promises; and because of our output of 300 tons daily, big tonnage at all times.

Write us your wants and we'll gladly send further information.

Mendelson Bros. Paper Stock Co.

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Rags, Bagging, Rope and Waste Paper

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UNITED STATES LPSCo LARGEST RAG PACKERS

Highest Percentage Dressed Rag

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HAMILTON OHIO

New York Office, 501 Fifth Avenue

Papermaking Rags

Two major factors are making for an easy undertone in the papermaking rag market. One is that consuming mills are buying in exceptionally small amounts, most manufacturers today being more concerned in using up stocks of rags bought some time ago at high prices than in augmenting their holdings, and the other being the approach of spring. It is about this season of the year when the weather moderates and spring housecleaning is in order that supplies of rags increase, and graders and dealers usually make an effort to clear their establishments of rags, so as to make way for the new collections. It is invariably the rule therefore that prices show a weakening tendency, and this year this condition is accentuated by the lack of important demand from consuming sources, with the result, rag values are steadily but gradually getting back to something approximating normal levels.

The decline in new cutting prices has been especially marked. The continued absence of paper mills from the market as buyers has obliged dealers to drastically reduce quotations in an effort to attract purchasers, despite which consumers are still absorbing supplies in very limited volume. For quite a time prices on new cotton rags were maintained at close to the top levels reached during the early part of last year because clothing factories were shut down and dealers were receiving little fresh supply. As matters have turned out, however, the production of most grades has been resumed before consuming demand has revived and prices have suffered in consequence. New No. 1 white shirt cuttings have sold to mills down to 13 cents a pound delivered, washables at 6 cents at shipping points, unbleached muslin cuttings at 11.50 cents and blue overall cuttings at 8 cents. Prices on other descriptions have declined in like proportion.

In old rags, roofing stock displays chief activity. Felt mills are buying in reserved but in more or less consistent fashion, and No. 1 roofing rags are readily bringing a cent per pound and slightly more f. o. b. shipping points. Old whites are quotably lower at 8 to 9 cents for No. 1 repacked and 4 to 4.50 cents for No. 2 repacked, while thirds and blues are available at 2.50 to 3 cents for repacked stock and 2 to 2.25 cents for rough packing.

Quotations f. o. b. shipping points follow:

New Stock—	New York and Chicago
White shirt cuttings, No. 1	12.50-13.50
White shirt cuttings, No. 2	7.50- 8.50
Fancy shirt cuttings	8.00- 8.50
Washables, No. 1	6.00- 6.50
Unbleached muslins	11.50-12.00
White lawns	12.00-12.50
Overall cuttings, blue	8.00- 8.50
Black silesias	4.75- 5.00
Old Stock—	
Whites, No. 1 repacked	8.00- 9.00
Whites, No. 2 repacked	4.00- 4.50
Whites, house soiled	2.50- 2.75
Whites, street soiled	2.00- 2.25
Thirds and blues, repacked	2.50- 3.00
Thirds and blues, rough	2.00- 2.25
Black stockings	2.60- 2.80
Lace curtains	6.00- 6.25
Cotton canvas, No. 1	4.25- 4.50
White cotton batting	2.50- 2.75
Roofing, No. 1	1.00- 1.10
Roofing, No. 2	.90- 1.00

Rope and Bagging

Papermakers are showing a little more interest in old rope, yet the movement into consuming channels continues considerably below normal. The rope market displays about as firm a tone as is in evidence in any other papermaking material, which seems due to a lack of large accumulations and to the reluctance of dealers to enter commitments covering future deliveries. It is a well known fact that in ordinary times not enough old rope is produced in the United States to fill the wants of consumers in this country, with the result that appreciable amounts are imported, especially from England. Recently importations have been light owing to the relative high cost of old rope in Europe as compared with market values here, and this has kept the market from becoming overburdened with stocks.

Around 4 cents a pound at shipping points is the basic generally paid for domestic Manila rope of No. 1 quality, with some transactions reported at a quarter of a cent higher. Old strings have declined in price to around 1.25 cents per pound. Bagging of every kind is neglected by paper mills, and buyers are securing supplies at close to their own figures. So dull is the demand that instances have been cited where No. 1 scrap bagging has been sold to mills at the price of roofing bagging. Gunny is scarcely wanted, and is mainly nominal in value. F. o. b. shipping point prices follow:

	New York and Chicago
Gunny, No. 1 domestic	1.60- 1.80
Gunny, No. 1 foreign	1.50- 1.75
Scrap bagging, No. 1	1.15- 1.30
Roofing bagging	.70- .80
Wool tares, heavy	2.00- 2.25
Wool tares, light	1.75- 2.00
Manila rope, No. 1 foreign	4.00- 4.25
Manila rope, No. 1 domestic	4.00- 4.25
Sisal strings	2.25- 2.50
Mixed strings	1.00- 1.25

Old Papers

Consumers are absorbing old paper in sparse amounts. There is some movement of supplies toward mills, of course; waste paper seldom, if ever, halting entirely in its flow into consuming channels, but business in various parts of the country is reported unusually light. Board mills, which are the chief users of low-grade waste paper, are buying a carload where in busier periods they absorb five cars, and consumers of the better grades are operating as buyers in proportionately small volume. The wood pulp situation doubtless has a good deal to do with the slow demand for waste paper as paper and board mills in frequent cases are enabled to secure the primary material at relatively less cost than the substitute stock notwithstanding that prices on the latter have continued to decline.

Much complaint is registered by packers on the present level of waste paper values. It is contended that most descriptions cannot be collected, sorted and packed for mill use at a profit under ruling prices, and there is no question but that a good many small concerns have forsaken the paper stock trade. The decrease in production, however, is hardly noticed because of the marked decline in demand; at the same time, this con-

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The Pulp and Paper Trading Co.
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Dealers in Domestic Chemical and Mechanical Pulps and Paper

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Made by Port Huron Sulphite & Paper Co., Port Huron, Mich.

E. J. KELLER COMPANY
INCORPORATED
200 FIFTH AVENUE
NEW YORK

FOREIGN AND DOMESTIC
PAPER MAKERS' SUPPLIES
COTTON, JUTE AND FLAX WASTES
COTTON BAGGING MATERIALS
EAST INDIA MERCHANDISE

Bleached and Unbleached
WOOD PULP
of Every Description
M. GOTTESMAN & COMPANY
INCORPORATED
18 East 41st Street NEW YORK, N. Y.
Established 1886

dition may have an important bearing on the market when consumption gets back to normal and mills are in want of more supply. Nevertheless it is quite probable that if prices should rise, additional collectors would promptly resume operations, thus increasing the output to normal volume.

Hard white shavings of No. 1 quality have sold to mills at 4 cents per pound at shipping points and No. 1 soft white shavings down to 3 cents, denoting sharp recession in prices. White news cuttings, which not long ago were commanding record prices of around $100 per ton, are now available at 2.25 cents per pound, this grade having declined sharply in conjunction with the fall in ground wood pulp. Old books and magazines are down to 1.40 cents a pound at shipping points, while ledger stock is freely available at 2.25 cents, old kraft paper at 2 cents, overissue newspapers at 80 cents per hundred pounds, folded news at 55 cents, and No. 1 mixed paper at 45 cents. Quotations f. o. b. shipping points follow:

	New York and Chicago
Hard white shavings, No. 1	4.00- 4.50
Hard white shavings, No. 2-3	3.00- 3.50
Soft white shavings	3.00- 3.50
Colored shavings	1.25- 1.50
Heavy book, No. 1	1.40- 1.60
Crumpled No. 1	1.15- 1.30
Ledger stock	2.15- 2.35
Kraft, No. 1	2.00- 2.25
Manilas, No. 1	1.00- 1.15
White blank news	2.25- 2.50
Overissue news, No. 1	.80- .90
Folded news	.55- .60
Mill wrappers	.70- .80
Box board cuttings	.55- .60
Mixed paper, No. 1	.45- .50
Common paper	.30- .35

Chemical Pulp

The chemical wood pulp trade has been marking time. There has been little activity of an important character in the market and producers and dealers as a rule have followed a policy of holding off pending a revival of demand. Sellers have appreciated that paper manufacturers have been in slight want of fresh supplies owing to the dullness prevailing in the paper trade and have not pressed their customers to buy, feeling that to endeavor to stimulate buying under prevailing circumstances would only serve to further weaken the market against themselves. The entire situation has been based on the lack of demand from consumers, who, not needing pulp for immediate use, have refrained from buying until being better advised as to what their future requirements are likely to be. Despite the steady downtrend of prices and the inactive position of the market, nearly everyone continues confident and predicts that in the course of time when the paper market and business generally become more stabilized demand for pulp will revive in like proportion to the increased activity in paper.

Consumers in common are entering the pulp market only when in direct need of supplies and are even then limiting orders mainly to small lots of pulp required to fill in contract deliveries. Paper mills the country over have been and are still bent on liquidating their stocks of raw material, and aside from covering their actual wants are refusing to absorb other supplies. Current business therefore is largely confined to small amounts of pulp found available for spot shipment at prices close to the low edge of quotational levels.

Leading domestic producers of bleached sulphite have lowered prices to 6.50 cents a pound at pulp mills on this grade of pulp, and some qualities of bleached sulphite are to be had down to 6 cents. Domestic easy bleaching sulphite is quoted at 5 cents, No. 1 unbleached at 4.50 to 5 cents and news grade sulphite at 4.25 to 4.50 cents. Kraft has sold at as low as

Largest producers in the world of highest grade Brimstone —guaranteed 99% pure—free of Arsenic and Selenium.

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In so far as possible we will be glad to offer advice or suggestions to prospective buyers who are using or may be contemplating the use of brimstone.

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4.25 cents a pound although strictly No. 1 spruce kraft is held by most mills at 4.50 cents or better.

Quotations f. o. b. pulp mills follow:

Bleached sulphite	6.00- 6.50
Easy bleaching sulphite	5.00- 5.50
Unbleached sulphite No. 1	4.50- 5.00
News grade sulphite	4.25- 4.50
Soda pulp, bleached	6.50- 7.00
Mitscherlich unbleached	5.50- 6.00
Kraft No. 1	4.25- 4.50
Screenings, refined	1.25- 1.50

Mechanical Pulp

Under a pronounced lack of important demand from consuming quarters, prices on mechanical wood pulp have declined sharply and now prevail on levels lower than at any time since the war and representing a drop from the high point reached during the past year of approximately 65 per cent. Sales of prime spruce ground wood have been reported down to $45 per ton f. o. b. grinding plants, and while it is contended by many in the trade that only lots which manufacturers are anxious to dispose of and are willing to sell at a sacrifice are available at this basis, the fact remains that the great bulk of business current is at around this figure, or at but a shade higher. Some producers, and among the largest in the country and in Canada, are quoting $60 to $65 at pulp mills, but it is questionable whether they are managing to effect sales at these prices because buyers are enabled to obtain the limited supplies wanted for so much less.

With spring coming on when production usually is increased, the outlook for the market is not altogether encouraging unless consumption appreciably increases. It is believed, however, that stocks at consuming plants are light, which is a strengthening factor, and it is known that a good many producers have materially reduced their output so that manufacturers' stocks are likely small, which also should have considerable influence when the market condition reverts to something approaching normal.

Chemicals

Contract business constitutes the bulk of activity in papermaking chemicals, and while the undertone of prices is somewhat easy there has been no broad change in quotations. Standard brands of caustic soda for prompt delivery are offered at an average of about 3.75 cents per pound f. o. b. works, with the contract basis around 3.60 cents. Soda ash is fairly steady at a quotable price of 2.25 cents for spot delivery ex warehouse or works. Domestic producers of bleaching powder quote between 3.25 and 3.50 cents a pound but foreign supplies of bleach are offered down to 2.50 cents, and consumers are centering their buying at present on the imported product. Brimstone is steady at $15 to $16 per ton at mines, and casein is moving in moderate amounts at around 14 cents a pound. Quotations range as follows:

Alum, lump ammonia	4.00- 4.50
Alum, lump starch	7.50- 8.00
Alum, powdered	5.00- 5.50
Blanc fixe, powdered	3.75- 4.00
bleaching powder (domestic drums)	3.25- 3.50
Brimstone (ton)	15.00-16.00
Casein	13.00-15.00
Caustic soda, spot delivery	3.60- 3.75
China clay, domestic, washed	8.00- 9.00
China clay, foreign	14.00-16.00
Rosin, grade E	8.75-
Satin white	2.25- 2.75
Soda ash, 58 per cent light (bags)	2.00- 2.25
Sulphite of alumina, commercial grade	2.25- 2.50
Starch, papermakers', in bags	3.43-
Talc (ton)	16.00-18.00

We specialize in raw materials for the manufacture of all grades of paper and offer from stock:

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Colored	16-24
Ledger—	
White rag	23-50
White sulphite	16-25
Colored sulphite	18-26
Colored rag	25-
Bonds—	
White rag	16-45
White sulphite	14-23
Colored sulphite	16-26
Colored rag	18-
Book—	
No. 1 S. & S. C	12.00- 12.50
Machine finished	10.00- 10.50
English finished	11.00- 12.00
Coated and enameled	13.00- 14.00
Lithograph, M. F	13.00- 14.00
News Print—	
Rolls, contract	5.00- 5.70
Rolls, transient	5.00- 5.50
Sheets	6.50- 7.00
Side runs	4.00- 4.50
Cover Stock—	
Coated, both sides	10.25-
Coated, one side	10.20-
Wrappings—	
No. 1 kraft	8.00- 8.50
No. 2 kraft	7.00- 7.50
Boards—	New York and Chicago
Solid news	35.00- 40.00
Straw	35.00- 40.00
Plain chip	30.00- 35.00
White coated chip	35.00- 60.00
Manila coated chip	50.00- 55.00
Binders board	75.00- 85.00

Chicago to Hold Pageant of Progress Exposition

Chicago expects that its usual throng of summer visitors will be increased by two or three millions this summer, the lure being a great business show under the name of the Pageant of Progress Exposition.

The exposition will be held on the city's great Municipal Pier, stretching out into the lake for more than 3,000 feet, and affording exhibition space ten times as great as the Coliseum, in which the big shows such as the annual automobile show, the national political conventions and other large assemblies are held now. The dates set are July 30 to August 14, having been advanced from September at the request of business men, who believe a great rush of fall buying will result from the comprehensive exhibits to be made by practically every line of industry.

The exposition has been incorporated, with Mayor William Hale Thompson as its president, and is being supported by the Chicago Boosters' Publicity Club, Inc., the Chicago Association of Commerce, the Illinois Manufacturers' Association and the Health and Sanitation Exposition.

Originally conceived by Mayor Thompson as a purely Chicago enterprise, to stimulate business and reduce unemployment, the exposition has been broadened into portrayal of the business and industrial development of the entire country as the result of the interest shown by manufacturers and business men generally and their demands that they be allowed to display their wares to the hosts it will draw.

George J. Kroeck, chairman of the paper products division, has already sold more than 1,200 square feet of exhibition space for the paper men, and has promised the Mayor he would sell 28 spaces, a half section, before he finished canvassing the industry.

"I am trying to arrange as varied an exhibit as possible," said Mr. Kroeck to the Mayor. "Until I began interviewing various paper product manufacturers, I really had no idea of the many things that are manufactured from paper."

One firm is arranging an exhibit with ten girls working on a machine which turns out paper candy boxes. Another will install a machine into which a sheet of paper is fed at one end and a finished, folded, gummed and printed envelope comes out at the other.

Paper-flower manufacturers also are planning a large exhibit and fibre and boxboard shipping case men will have another.

Nearly all the exhibits in this section will be mechanical in their nature, showing the various processes between the raw material and the finished product.

Pulp Grinding Mill at Little Falls, Minn.

The Itasca Paper Company of Grand Rapids, Minn., is extending its operations and a plant for grinding pulp is now being built at Little Falls. The new plant is to grind pulp which will be shipped to Grand Rapids for use in connection with the new paper making machine which will soon be under operation here.

The mill at Little Falls will be small and probably from twenty to twenty-five men will be employed. There will be two grinders operated by a 1,000 h. p. motor. The plant will operate from 200 to 250 days in a year, closing down during the winter months on account of shortage of power, which is purchased from the electrical company there. Two grinders are being shipped from Grand Rapids, but these machines will be replaced here as soon as these ordered are received.

A temporary building has been constructed at Little Falls A wet machine will be installed.

The reason for the construction is the shortage of power at Grand Rapids. The desire of the company is to grind all of its pulp and it is believed that the mill at Little Falls will provide all of this necessity that is needed in view of the increased operations here. In the meantime, the local plant is being brought to a high point of efficiency and all possible power from both the Mississippi and the Prairie rivers is being secured and utilized.

The Wanaque River Paper Company, manufacturers of book paper, has sold its mill at Wanaque, N. J., as a result of the plant being taken over by the North Jersey District Water Supply Company, which concern supplies the city of Newark, N. J., with water. The mill closed down on February 27 and will be dismantled. Offices of the Wanaque River Paper Company are being continued at 290 Broadway, New York City.

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Chemical Pulp

A waiting condition characterizes the market for imported wood pulp in the United States. There is little business of importance being done, as would be expected with paper manufacturers experiencing exceptional quietness in their own field, and most members of the trade are holding aloof pending the development of demand for pulp. Occasional transactions are reported in pulp on the spot in this country and now and then an order is placed for pulp for forward shipment from primary markets, but these sales seldom involve large tonnage and in the aggregate have but slight influence on the market situation. Papermakers seem indisposed to contract ahead with present conditions so uncertain; moreover, importers in most cases are not attempting to effect business for the present, realizing that consumers have little need for fresh supplies for the time being and appreciating that to exert pressure on buyers would merely serve to weaken matters against themselves.

Judging from authoritative reports, conditions in Sweden —the chief source of supply in Europe for the American market—are quite similar to those obtaining here. Swedish manufacturers are encountering little demand for pulp, and having most of their near commitments covered by fair-sized stocks, are curtailing their production temporarily. Scandinavian manufacturers of pulp are placed in an unfavorable position at present. The cost of raw materials is so high on the other side that it is maintained pulp cannot be profitably produced to sell at low enough prices to compete with Canadian and American pulps, which situation is obviously telling on Sweden's pulp trade. Then, too, Germany is said to be undermining Sweden's pulp business by selling German-made pulp to various European consumers at considerable less than the Scandinavians can afford to market their product. Very little supply has been imported into the United States from any source other than Canada during the past few weeks, arrivals at the port of New York in February, as the list of receipts below will show, being almost negligible.

There are no established market values and the quotations below are largely nominal, being based principally on the scattered sales recorded recently, many of which have been made at a monetary loss to importers. Arrivals at New York during February and approximate market prices follow:

Bleached sulphite	$ 8.00-$ 8.25
Unbleached sulphite, No. 1	5.50- 6.00
Easy bleaching	6.00- 6.50
Mitscherlich unbleached	6.50- 7.00
Kraft	4.50- 5.00
Ground wood, per ton	60.00- 70.00

Scandinavian-American Trading Co., 762,000 kilos from Gothenburg; American Woodpulp Corp., 400 bls. from Gothenburg; American Foreign Banking Corp., 1,600 bls. from Kobe; Mitsui & Co., 1,695 bls. from Kobe; J. Kahn, 736 bls. from Kobe; E. M. Sergeant & Co., 200 bls. from Christiania; Castle, Gottheil & Overton, 256 bls. from Rotterdam; National City Bank, 31 bls. from Gothenburg; Fred Enders & Co., 375 bls. from Gothenburg; H. Hamrin, 960 bls. from Gothenburg; Order, 500 bls. from Gothenburg and 2,195 bls. from Rotterdam.

Paper Stock

Very light receipts of paper stock into the United States reflect the dullness ruling in the paper manufacturing industry of this country. Importers naturally are bringing forward little supply owing to difficulty in finding an outlet for goods among consuming mills, and because most of them have stocks in store here which they are unable to move at desired prices. As would be expected, stocks are accumulating in European countries on which the market here draws when there is a demand, and yet dealers on the other side are said to be displaying a fairly strong attitude regarding prices, and to be frequently turning down bids on material that fail to come up to their ideas of values. The probabilities are that at least some consumers in the United States, roofing felt mills especially, could be prevailed upon to contract for good-sized tonnages of foreign rags for future delivery if they could obtain supplies at prices recognized as approximate current market levels, but importers assert that they cannot persuade dealers on the other side to make commitments involving rags for forward shipment at the present price basis, anticipations presumably being that the market here will advance when the need for stock increases. Such business as is passing consequently is confined to small lots available at low quotations. Receipts at the port of New York during February were:

Old Rope

E. J. Keller Co., 100 bls. from Rotterdam; Brown Bros. & Co., 565 coils from Hull; Old Colony Trust Co., 154 coils from Bristol; Order, 320 bls. from Barcelona.

Old Bagging

Equitable Trust Co., 294 bls. from Antwerp; E. J. Keller Co., 51 bls. from Genoa; New Netherland Bank, 56 bls. from Havre; Order, 3,067 bls. from Antwerp.

Rags

National City Bank, 60 bls. from Antwerp and 235 bls. from Havre; State Bank of New York, 133 bls. from Antwerp; Equitable Trust Co., 47 bls. from Antwerp, 190 bls. from Oran and 95 bls. from Havre; New Netherland Bank, 385 bls. from Havre; Ladenburg, Thalman & Co., 66 bls. from Hamburg; Brown Bros. & Co., 86 bls. from Havre; E. J. Dupont de Nemours Co., 13 bls. from London; American Woodpulp Corp., 261 bls. from Hamburg; Castle, Gottheil & Overton, 604 bls. from Bordeaux, 119 bls. from Genoa and 449 bls. from Havre; W. Hughes & Co., 111 bls. from Genoa; H. J. Reed, 288 bls. from Trieste; A. Katzenstein, 256 bls. from Havre; Salomon Bros. & Co., 525 bls. from Havre; Order, 67 bls. from Bordeaux, 2,212 bls. from Constantinople, 711 bls. from Havre, 64 bls. from Liverpool, 67 bls. from Alexandria and 98 bls. from London.

Miscellaneous Paper Stock

Irving National Bank, 21 bls. from Antwerp and 99 bls. from Glasgow; Ladenburg, Thalman & Co., 38 bls. from Belfast; Edwin Butterworth & Co., 212 bls. from Belfast; Wilkinson Bros. & Co., 67 bls. from Rotterdam; Northern Metals Selling Co., 380 bls. from Rotterdam; E. J. Keller Co., 405 bls. from Rouen; Order, 647 bls. from Rouen and 20 bls. from Glasgow.

Paper

It is stated on reliable authority that newspaper publishers who, when domestic news print was scarce and high in price contracted ahead for news print to be imported from Ger-

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Built of selected Canadian White Pine, Wyckoff Wood Pipe is wound with steel bands whose tensile strength is 58,000 to 65,000 lbs. per square inch. The experienced engineer selects a pipe of proven dependability. Wyckoff Wood Pipe, during the past 65 years, has built a reputation that stands the keenest competition. It has been, during this time, the choice of the largest pipe users in the world. We also manufacture a high grade underground steam pipe casing.

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many, are now endeavoring to resell their foreign supply of paper so as to fill their requirements with domestic or Canadian news print, the reason for this, it being said, is that the paper obtained in Europe has not proven satisfactory. The publishers of at least one of the largest dailies in the East have reverted to the use of domestic news print after having run on German-made paper for quite a period and notwithstanding that they have a large tonnage of European news print under contract, which they are trying to dispose of. Nevertheless fairly large amounts of print paper continue to come into the American market from Germany and Scandinavia, approximately 24,700 rolls of news print being received through the port of New York alone in February. Whether this paper is finding a ready market here is problematical; judging from the reports of the low prices at which some of it is being sold, it is not.

Normal quantities of cigarette paper are being imported from France, and occasional large shipments of strawboard from Germany are arriving. There is also the usual amounts of filter, hanging and specialty papers coming in. Imports at the port of New York in February follow:

Cigarette

American Tobacco Co., 632 cs. from Bordeaux and 13 cs. from Havre; Bankers Trust Co., 178 cs. from Genoa; P. J. Schweitzer, 20 cs. from Marseilles; B. J. Teale, 30 cs. from Marseilles; Societe Piemontese di Transp., 45 cs. from Trieste; Rose & Frank Co., 45 cs. from Havre; Surburg Co., 39 cs. from Havre; J. Gorakian, 5 cs. from Constantinople; Kaufman Bros. & Bondy, 15 cs. from Bordeaux; Knauth, Nachod & Kuhne, 2 cs. from Trieste; R. J. Reynolds Tobacco Co., 530 cs. from Bordeaux; Order, 11 cs. from Constantinople and 5 cs. from Marseilles.

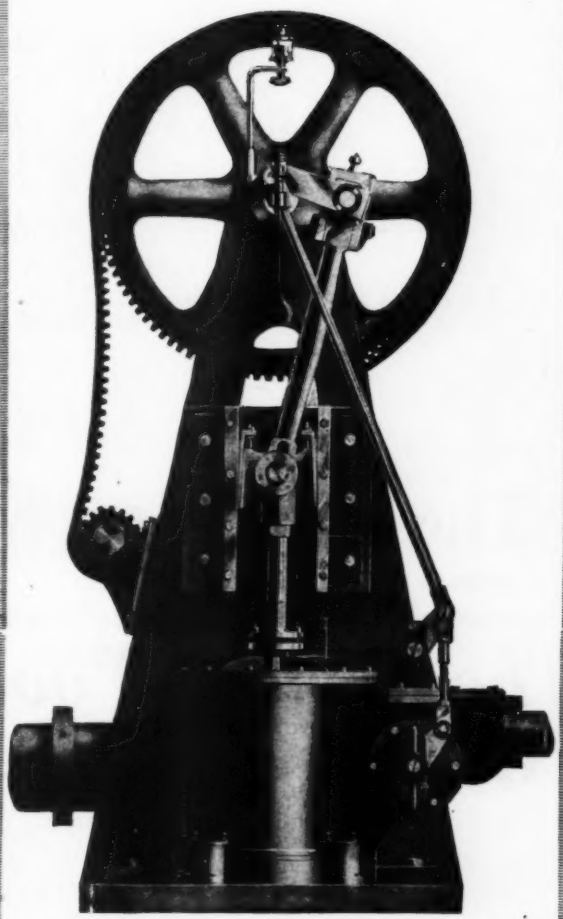
Printing

New York American, 4,787 rolls from Hallstavik; Chase National Bank, 154 rolls from Hamburg; National City Bank, 1,528 rolls from Hamburg and 400 rolls from Helsingfors; F. Henjes, Jr., 7 cs. from Hamburg; Irving National Bank, 951 rolls from Hamburg; 176 rolls from Gothenburg and 735 rolls from Rotterdam; Oxford University Press, 23 cs. from Liverpool; B. F. Drakenfeld & Co., 31 cs. from Liverpool; H. W. Robinson & Co., 2 cs. from Havre; H. Reeve-Angel, 28 bls. from Helsingfors; Chemical National Bank, 980 rolls from Christiania; New York Overseas Co., 830 rolls from Christiansand; C. L. Robinson, 222 rolls from Gothenburg; First Federal Foreign Banking Assn., 207 rolls from Helsingfors; Equitable Trust Co., 55 rolls from Hamburg; Agar Bernson Corp., 996 rolls from Hamburg; Philadelphia National Bank, 306 rolls from Hamburg; L. Frey, 2 cs. from Rotterdam; Knauth, Nachod & Kuhne, 31 rolls from Hamburg; Harrison National Bank, 443 rolls from Hamburg; Pulp & Paper Trading Co., 671 rolls from Hamburg; Boncomni & Millar, 586 rolls from Helsingfors; Agros Corp., 4,887 rolls from Helsingfors; Bank of New York, 202 rolls from Christiania; American Foreign Banking Corp., 258 rolls from Christiania, 60 rolls from Copenhagen and 586 rolls from Helsingfors; American Express Co., 93 rolls from Hamburg; E. Dietzgen & Co., 3 cs. from Hamburg; Globe Shipping Co., 20 cs. from Hamburg; Order, 70 rolls from Bordeaux, 719 rolls from Hamburg, 1,347 rolls from Christiania, 33 rolls from Antwerp, 1,044 rolls from Gothenburg, 4 rolls from Liverpool, 908 rolls from Fredrikstvald, 248 rolls from Christiansand, 485 rolls from Brevik and 168 rolls from Copenhagen.

Wrapping

Herrmann Paper Co., 24 bls. from Hamburg; Birn & Wachenheim, 85 pkgs. from Rotterdam; National Bank of New York, 10 rolls from Gothenburg; M. H. Whitelaw, 5 bls. from Hamburg; Maurice O'Meara Co., 290 lbs. from Helsingfors; Irving National Bank, 59 bls. from Antwerp; Atlantic

High Efficiency Vacuum Exhausters



This exhauster is a well designed high efficiency piston displacement machine with extremely low clearance, showing indicator cards closely approximating the ideal for apparatus of this character.

The machine is simple in construction, of few parts which are easily accessible for oiling and adjustment, and is capable of long periods of continuous day and night operation without stopping for adjustment.

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BETTER THAN EVER

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AS GOOD AS THE CHIPPER

The NEW Carthage Pulp Shredder
A REMARKABLE PERFORMER
IT DOES WHAT NO OTHER SHREDDER CAN DO

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KEEPS DIRT OUT OF YOUR SHEET

The Carthage Ball Bearing Straightway Blow Valve
IT IS VERY DURABLE IT IS EASY TO HANDLE

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Carthage New York

The Noble & Wood Machine Co.

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Paper Mill Machinery

National Bank, 79 cs. from Hamburg; Order, 151 bls. from Hamburg and 42 bls. from Rotterdam.

Writing

Japan Paper Co., 7 cs. from Havre; G. W. Sheldon & Co., 2 cs. from Havre; W. A. Wilberface & Co., 2 cs. from London.

Hanging

A. C. Dodman, 37 bls. from Antwerp and 27 bls. from Liverpool; W. H. S. Lloyd & Co., 70 bls. from London, 17 bls. from Liverpool and 1 cse. from Antwerp; R. C. Fritz, 432 pkgs. from Antwerp; Prager Co., 1,589 bls. from Antwerp; A. Murphy & Co., 3 cs. from London, 2 cs. from Liverpool and 5 bls. from Southampton; R. F. Lang, 11 pkgs. from London; Asam Bros., 14 cs. from Antwerp; State Forwarding & Shipping Co., 100 bls. from Hamburg; Order, 5 cs. from Antwerp and 858 bls. from Hamburg.

Tissue

R. Hoe & Co., 14 bls. from London; American Express Co., 35 bls. from Christiania; Davis & Gilchrist, 12 cs. from Liverpool; National City Bank, 60 pkgs. from Hamburg; F. C. Strype, 10 cs. from Liverpool; Wilkinson Bros. & Co., 9 cs. from Liverpool; Order, 273 bls. from Christiania.

Drawing

Lunham & Moore, 7 cs. from London; Keuffel & Esser Co., 68 rolls from Hamburg and 18 cs. from Rotterdam; Favor, Ruhl & Co., 5 cs. from London; American Shipping Co., 3 cs. from Hamburg.

Filter

E. Fougera & Co., 76 cs. from Bordeaux and 17 cs. from Marseilles; A. Giese & Sons, 5 bls. from Hamburg; J. Manheimer, 80 lbs. from Bordeaux; Lunham & Moore, 37 cs. from London; Zinkeisen & Co., 16 bls. from Hamburg.

Boards

Phoenix Shipping Co., 2 cs. from Hamburg; State Bank of New York, 71 cs. from Hamburg; Guaranty Trust Co., 100 bls. from Hamburg; National City Bank, 5,536 rolls from Rotterdam; Harriman National Bank, 4,000 bls. from Rotterdam; Irving National Bank, 508 rolls from Rotterdam; Mengel & Co., 290 rolls from Rotterdam; Riegel & Co., 501 rolls from Rotterdam; Uberall, Ries & Uberall, 10 cs. from Hamburg; Lincoln Trust Co., 267 bls. from Rotterdam; Columbia Corrugated Co., 297 rolls from Rotterdam; American Express Co., 196 pkgs. from Liverpool; R. F. Lang, 2 cs. from Hamburg; Bernard, Judae & Co., 52 cs. from Hamburg; Happel & McAvoy, 4 cs. from Hamburg; A. Bourjois & Co., 40 cs. from Bordeaux; Order, 363 rolls from Antwerp and 96 bls. from Hamburg.

Miscellaneous

G. W. Sheldon & Co., 2 cs. from Bordeaux, 5 cs. from Havre and 2 cs. from Hamburg; Japan Paper Co., 22 cs. from Yokohama and 93 cs. from Genoa; Maritime Line, 12 cs. from Hamburg; E. Daiber, 3 cs. from Antwerp; International Forwarding Co., 18 bls. from Hamburg; Republic Bag & Paper Co., 369 bls. from Hamburg; Coy, Hunt & Co., 235 bls. from Gothenburg; Guaranty Trust Co., 106 bls. from Gothenburg; Goodman & Levy, 6 cs. from Havre; P. N. Cerf & Co., 3 cs. from Havre; Whiting-Patterson Co., 2 cs. from Havre; Happel & McAvoy, 3 cs. from Hamburg; American Express Co., 8 cs. from Bremen and 289 pkgs. from Liverpool; H. A. Caesar & Co., 2 cs. from Havre; Sussfield, Lorsch & Schimmel, 4 cs. from Havre; Hensel, Bruckmann & Lorbacher, 2 cs. from Hamburg; G. Borgfeldt & Co., 2 cs. from Hamburg; L. A. Consmiller, 102 cs. from Rotterdam; Bitingen, Schild & Co., 5 cs. from Rotterdam; Tokstad Co., 2 cs. from Bergen; Blauvelt-Wiley Paper Co., 10 bls. from Glasgow; Zellerbach Paper Co., 17 cs. from Antwerp; F. B. Vandegrift & Co., 12 cs. from Hamburg; H. Bayersdorfer & Co., 10 cs. from Antwerp; Dalton Adding Machine Co., 20 cs. from Copenhagen; Bendix Paper Co., 5 cs. from Hamburg; Globe Shipping Co., 201 pkgs.

BROWNHOIST

Handling Materials at the Mill

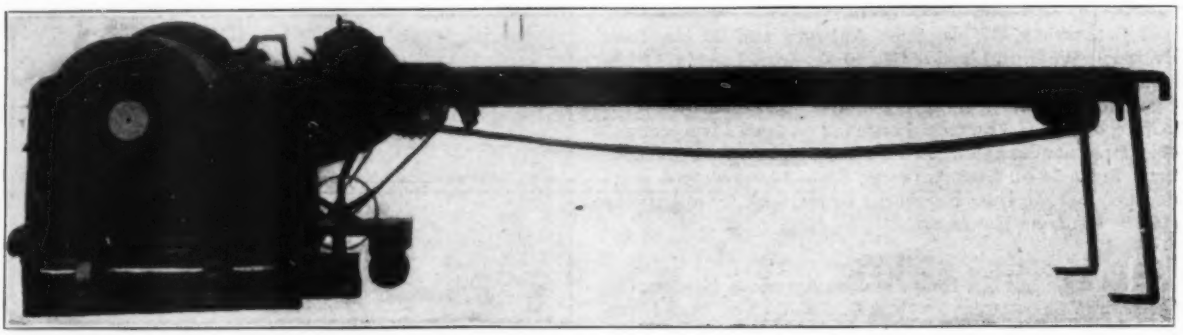
IS YOURS one of the many mills which handles considerable pulp? Some of these have found it to be more rapid and economical to do this handling with a Brownhoist locomotive crane. A Brownhoist will not only place the pulp wherever it is needed, but will handle your coal, switch the cars and take care of innumerable jobs which come up around the yard. If you have much handling to do, our long crane experience should be of use to you. We will gladly give you any information for the asking.

The
Brown Hoisting Machinery Co.
CLEVELAND, OHIO, U. S. A.

Engineers and Manufacturers of Heavy Dock Machinery, Bridge Cranes, etc., as well as smaller Cranes and Hoists

Branch Offices in New York, Pittsburgh, Chicago and San Francisco.

No. 11 "GIANT" PAPER STOCK CUTTER



Capacity 2½ Tons Per Hour
Especially Adapted for Handling Waste Paper, Magazines, Etc., Before Feeding to the Beaters

Whatever You Cut, A GIANT Will Solve Your Problem

LET US FIGURE IT OUT FOR YOU

TAYLOR, STILES & COMPANY, Riegelsville, N. J., U.S.A.

WATEROUS ENGINE WORKS
Brantford, Ont., Canada
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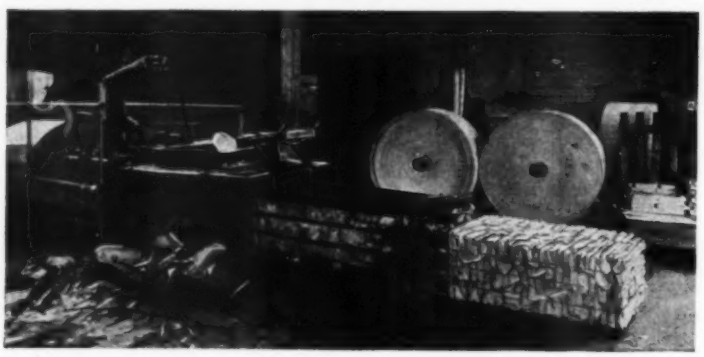
Sole Agents for Europe

THE *"FAMOUS OHIO"* BALING PRESS

"Judged by the Companies it Serves"



"The best on the market" is the way the National Carton Co. describes the Famous Ohio. This shows one operating in their plant at Joliet, Ill.

You should judge the Famous Ohio by the companies it serves, and by what they say about it.

Among the users of the Famous Ohio are the Eastman Kodak Co., John Wanamaker, and the publishers of the Saturday Evening Post.

They say such things as this: "We have found this baler to give absolute satisfaction under very trying conditions. We started with one and have increased our number to five, which we feel is a good recommendation in itself." Another says: "We find that one man can do the work of two and in about one-quarter of the time."

The Famous Ohio is the leading baler for all compressible materials.

FAMOUS Ohio BALING PRESS

Our new illustrated Baling Press catalog will be sent on request

The* Ohio Cultivator *Co.
Bellevue, Ohio

from Hamburg; Stern Shipping Co., 28 cs. from Hamburg; J. Spiero Co., 3 cs. from Hamburg; Mansell, Hunt, Catty Co., 4 cs. from Rotterdam; Lindt Chocolate Co., 2 cs. from Havre; J. B. Mast & Co., 4 cs. from Genoa; Equitable Trust Co., 75 cs. from Hamburg; Defender Photo Supply Co., 4 cs. from Gothenburg; G. Gennert, 2 cs. from London; Bernard, Judae & Co., 5 cs. from Hamburg; National City Bank, 36 cs. from Hamburg; A. O'Brien, 21 cs. from Hamburg; Gerhard & Hey, 12 cs. from Hamburg; H. D. Catty & Co., 4 cs. from Hamburg; Order, 80 bls. from Hamburg, 44 cs. from Canton and 6 cs. from London.

Foreign Trade Opportunities

A firm of importers in South Africa desires to secure agencies for the sale of paper. Reference. For further data those interested should communicate with the Bureau of Foreign and Domestic Commerce, Washington, D. C., referring to Inquiry No. 34456.

A commercial agent from the Canary Islands is in the United States for a short time and desires to secure an agency for the sale of paper. References. For further data those interested should communicate with the Bureau of Foreign and Domestic Commerce, Washington, D. C., referring to Inquiry No. 34459.

An American firm of manufacturers and exporters of fiber-extracting machinery desires to secure agencies for the sale in Latin America, Far East and Africa of machinery and technical lines. Reference. For further data those interested should communicate with the Bureau of Foreign and Domestic Commerce, Washington, D. C., referring to Inquiry No. 34421.

Hartje Paper Mfg. Co. Badly Involved

A meeting of the creditors of the Hartje Paper Manufacturing Company of Steubenville, Ohio, was held recently for the purpose of hearing the statement of the receiver who was appointed by the Federal court at Columbus. Mr. Geo. E. Weisner, the receiver, who is general manager of the Carnegie Steel Company, at Mingo, had only opportunity to make a casual investigation of the condition of the paper company. The statement submitted to the creditors, who represent a large number of banking and commercial institutions in this section, shows assets amounting to $2,113,801.14 and liabilities at $1,499,066.19; net value, according to appraisement, $614,735.95.

The Hartje Paper Manufacturing Company was organized to take over the Hartje paper plant about three years ago, buying it from the Hartjes of Pittsburgh, and also taking over the wholesale paper interests of the Hartjes at the same time. The company entered into a program of expansion, expending a large sum of money on improvements in the Steubenville plant. During the paper shortage last year it did a large business, and seemed to be very prosperous, but expansion and contracts of various kinds and work at high prices impaired the assets of the concern and brought about the receivership. A number of Wheeling concerns are among the creditors.

Howard Paper Mill Adds to Capacity

The Howard Paper Company of Urbana, Ohio, resumed operations the latter part of February after a five-weeks close down. They have now completed extensive improvements in the building and have added a great deal of new machinery and equipment, which will add 25 per cent additional capacity to the plant and greatly improve their quality of paper.

This recent suspension of operation is the first interruption the mill has had since it was built in Urbana ten years ago and this opportunity was taken advantage of to make many badly needed repairs.

Millspaugh Suction Rolls and Shower Pipes

Over 700 Rolls in Service to date. 9 Rolls Per Month Shipped Since January! 48 Orders in our shop December 1st. In less than one year 50 repeat orders for Suction Rolls from satisfied customers who had one or more already in service.

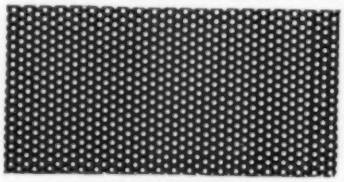
More Than 7 Miles Millspaugh Shower Pipes Shipped to Date

THE SANDUSKY FOUNDRY AND MACHINE COMPANY
Sandusky, Ohio

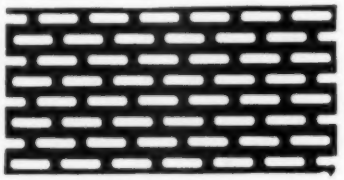
Appleton

Felts and Jackets
Manufactured By
APPLETON WOOLEN MILLS
APPLETON, WIS.

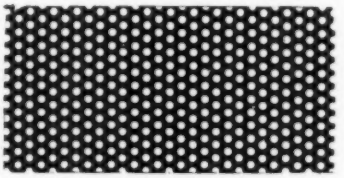
Perforated Metal Screens for Pulp and Paper Mills



.065 inch round



⅛ x ½" Slots



3/32 inch round

Steel, Copper, Brass, Bronze and other alloys punched for Centrifugal and Rotary Screens, Pulp Washers, Drainer Bottoms, Filter Plates, etc.

CHARLES MUNDT & SONS 57-65 Fairmount Avenue, Jersey City, N. J.

Gibbs-Brower Bulletin

Mills For Sale

Book, Writings and Ledger Mill—10 Tons Capacity.

Tissue Mills, Toilet, Crepe, Twisting, Copying, Pattern, and Carbon—5 to 15 tons capacity.

Large Water Finished Fibre, Kraft, Mill Wrappers and Board Mill—4 machines—2 Fourdriniers and 2 Cylinders—110 tons capacity. Also Sulphite Pulp Mill—35 tons capacity.

Bag Mill, 2 Fourdrinier Machines. Unsurpassed water power. 20 tons production. Also Ground Wood Pulp Mill—7 tons production.

Straw Kraft, Butchers Fibre, Sulphite Wrapper Mill—10 tons capacity.

Carpet and Car Lining, Bogus and Colored Wrappings Mill—18 tons capacity.

Water Finish Fibre Mill—27 tons capacity. Pulp Mill—Dry Ground Wood—12 tons. Sulphite Fibre—15 tons capacity.

Binders Board Mill—15 tons capacity.

Chipboard and Sheathing Specialties Mill—5 tons capacity.

Container, set up Box Board and Folding Box Board Mill—50 tons capacity.

Boxboard and Newsboard Mill—50 tons capacity.

Container Jute, Test Kraft and Special Kraft Board Mill—20 tons capacity. Pulp Mill, Ground Wood—10 tons capacity. Excellent water power.

Felt roofing mill—10 tons capacity.

Small ground wood mill.

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Paper and Pulp Mill Brokers

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Our Motto, "Service First"

BUILD NOW

The history of American business development shows that its remarkable progress is due largely to the courage, foresight, boldness, and broadness of vision of our leaders.

Such qualities were never needed more than they are today.

If we are to pay our huge war bills, develop our domestic markets and take a place among the large trading nations of the world, we must multiply our production many times.

In order to do this we must have greatly increased manufacturing and trading facilities.

Let us not pay too much attention to prices but rather give heed to the great need.

Ranger Built Is Well Built

Casper Ranger Construction Co.

Main Office, HOLYOKE, MASS.

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Springfield, Mass. New York, N. Y.

Boston, Mass.

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WATER

PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO., PITTSBURGH, PA.

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

ADHESIVES
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

ACID RESISTING BRONZE
Sandusky Foundry & Machine Co., Sandusky, Ohio.
William A. Hardy & Sons, Fitchburg, Mass.

ACID RESISTING PAINT
Detroit Graphite Co., 503 12th St., Detroit, Mich.

AGITATOR EQUIPMENT
The Hill Clutch Co., Cleveland, Ohio.
Moore & White Co., Philadelphia, Pa.

AIR CONDITIONING AND CONTROL APPARATUS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

ALKALI
Diamond Alkali Co., Pittsburgh, Pa.
Wing & Evans, 22 William St., N. Y. C.

ANGLE VALVES
The Crane Company, Chicago, Ill.

ARCHITECTS
James L. Carey, 208 N. Laramie St., Chicago.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
George F. Hardy, 309 Broadway, New York City.

ASH CONVEYORS
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

ASH HANDLING SYSTEMS
Jeffrey Manufacturing Co., Columbus, O.

ASSORTING TABLES
Moore and White Co., Philadelphia, Pa.

AUDITORS
Morris Rosenblum, 51 Liberty St., N. Y. C.

AUTOMATIC COOKING CONTROL
Trimbey & Allen, Glens Falls, N. Y.

AUTO TRUCKS
The White Co., Cleveland, O.

BALING PRESSES
Ohio Cultivator Co., Belleville, O.

BALLS (Brass)
The Draper Mfg. Co., Port Huron, Mich.

BANDLESS ROLLS
Dayton Globe Iron Works, Dayton, O.
Valley Iron Works Co., Appleton, Wis.

BARKERS
Carthage Machine Co., Carthage, N. Y.
Holyoke Machine Co., Holyoke, Mass.
Union Iron Works, Bangor, Me.
Valley Iron Works Co., Appleton, Wis.

BARK SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.

BEATER BARS
John W. Bolton & Sons, Inc., Lawrence, Mass.

BEATER BED PLATES
John W. Bolton & Sons, Inc., Lawrence, Mass.

BEATER ROLL FILLING
John W. Bolton & Sons, Inc., Lawrence, Mass.

BEATING, WASHING AND BLEACHING ENGINES
Dayton Beater & Hoist Co., Dayton, Ohio.
Dayton Globe Iron Works, Dayton, O.
Holyoke Machine Co., Holyoke, Mass.
Noble & Wood Machine Co., Hoosick Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.

BEATERS (Continuous)
Claflin Engineering Co., Lancaster, Ohio.

BELTING (Leather)
The Cleveland Oak Belting Co., 1239 W. 9th St., Cleveland, O.

BELT CONVEYORS
The Jeffrey Mfg. Co., Columbus, O.
Robins Conveying Belt Co., New York City.

BELT DRIVES
The Hill Clutch Co., Cleveland, Ohio.
The Link Belt Co., Chicago, Ill.

BLEACHING POWDER
Pennsylvania Salt Mfg. Co., Philadelphia.

BLEACHING (Propellers)
Moore and White Co., Philadelphia, Pa.

BLOWERS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

BOARD MACHINES
Beloit Iron Works, Beloit, Wis.
Valley Iron Works, Appleton, Wis.

BOARDS
The C. L. La Boiteaux Co., Cincinnati, O.

BOILERS
J. F. Davis, Chicago.

BOILER ARCHES
McLeod & Henry Co., Troy, N. Y.
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

BOILER BAFFLES
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

BOILER FEEDER
The Farnsworth Co., Conshohocken, Pa.
Earle Gear & Machine Co., Philadelphia, Pa.

BOILER SETTINGS
McLeod & Henry Co., Troy, N. Y.

BRASS WIRE CLOTH
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Lindsay Wire Weaving Co., Cleveland, Ohio.
W. S. Tyler Co., Cleveland, Ohio.
Wisconsin Wire Works, Appleton, Wis.

BRIMSTONE
Union Sulphur Co., 17 Battery Place, New York City.

BRONZE CASTINGS
Eastwood Wire Mfg. Co., Columbus, O.
Neenah Brass Works, Neenah, Wis.

BRONZE JACKETS
Sandusky Foundry & Machine Co., Sandusky, Ohio.

BUCKETS (Elevator)
Hendrick Mfg. Co., Carbondale, Pa.

BUNDLING SYSTEMS
Signode System, Lake St., Chicago

CALENDERS
Beloit Iron Works, Beloit, Wis.
Holyoke Machine Co., Holyoke, Mass.

CALENDER DOCTORS
Ticonderoga Machine Works, Ticonderoga, N.Y.

CALENDER ROLLS
Holyoke Machine Co., Holyoke, Mass.

CASEIN
The Kalbfleisch Corp., 31 Union Square, N. Y. C.

CAST IRON PIPE
U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

CAUSTIC SODA
Diamond Alkali Co., Pittsburgh, Pa.

CAUSTICIZING APPARATUS
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

CENTRIFUGAL PUMPS
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
The Earle Gear & Machine Co., Philadelphia, Pa.
Glens Falls Machine Works, Glens Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.

CHAIN BLOCKS
Yale & Towne Mfg. Co., Stamford, Conn.

CHAIN DRIVES
Weller Mfg. Co., 1820 N. Kostner Ave., Chicago.

CHEMICALS
Diamond Alkali Co., Pittsburgh, Pa.
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
The Grasselli Chemical Co., Cleveland, Ohio.
A. Klipstein & Co., 644 to 652 Greenwich St., New York City.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

CHIP CRUSHERS
Carthage Machine Co., Carthage, N. Y.

CHIPPERS
Holyoke Machine Co., Holyoke, Mass.
Union Iron Works, Bangor, Me.
Valley Iron Works Co., Appleton, Wis.

CHIPPER AND BARKER KNIVES
John W. Bolton & Sons, Inc., Lawrence, Mass.

CHIP SCREENS
Carthage Machine Co., Carthage, N. Y.

CIRCULAR KNIFE GRINDERS
Gibbs-Brower Co., New York City.

CLAYS AND FILLERS
Binney & Smith Co., 81 Fulton St., N. Y. C.
Daniel M. Hicks, 200 Fifth Ave., New York City.
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

COAL BUNKERS
The Brownhoist Co., Cleveland, Ohio.
The Jeffrey Mfg. Co., Columbus, O.

COAL & ASH HANDLING SYSTEMS
The Jeffrey Mfg. Co., Columbus, O.
Link Belt Co., Chicago.

COATED PAPERS
Bardeen Paper Co., Otsego, Mich.
Bermingham & Prosser, Chicago, Ill.
Dana T. McIver, 116 S. Michigan Ave., Chicago.
Seaman Paper Co., Chicago, Ill.

COMBUSTION ENGINEERS
The Engineer Co., 17 Battery Place, N. Y. C.

CONSISTENCY REGULATOR
Trimbey & Allen, Glens Falls, N. Y.

CONSTRUCTION (Building)
Casper Ranger Construction Co., Holyoke, Mass.

CONSULTING ENGINEERS
James L. Carey, 208 N. Laramie St., Chicago, Ill.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
George F. Hardy, 309 Broadway, New York City.

CONSULTING ENGINEERS (Power)
B. M. Baxter, Kirby Bldg., Cleveland.
H. B. Prather, 5716 Euclid Ave., Cleveland.

CONVEYORS
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Robins Conveying Belt Co., New York City.

CONVEYORS (Coal and Ash)
Jeffrey Manufacturing Co., Columbus, O.

COTTON LINTERS
Dallas Waste Mills, 130 Pearl St., New York City.

CRANES
The Brownhoist Co., Cleveland, Ohio.
John F. Byers Co., Ravenna, Ohio.
Northern Engineering Works, Detroit, Mich.
The Link Belt Co., Chicago, Ill.
McMyler Interstate Co., Bedford, Ohio.

CRUSHERS (Coal)
The Jeffrey Mfg. Co., Columbus, O.

CYLINDER MOLDS
Appleton Wire Works, Appleton, Wis.
Beloit Iron Works, Beloit, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
Glens Falls Machine Works, Glens Falls, N. Y.
The Lindsay Wire Weaving Co., Cleveland, O.
The W. S. Tyler Co., Cleveland, Ohio.

DANDY ROLLS
Appleton Wire Works, Appleton, Wis.
Central Mfg. Co., Kalamazoo, Mich.
Cheney Bigelow Wire Works, Springfield, Ohio.
Eastwood Wire Mfg. Co., Belleville, N. J.
Lindsay Wire Weaving Co., Cleveland, Ohio.
The W. S. Tyler Co., Cleveland, Ohio.

DECKEL FRAME SUPPORTS
Huband & Nash, Menasha, Wis.

DIGESTERS
Technical Products Co., 501 Fifth Ave., N. Y. C.

DRINKING WATER FOUNTAINS
Rundle-Spence Mfg. Co., Milwaukee, Wis.

DRUM WINDERS
Beloit Iron Works, Beloit, Wis.
Ticonderoga Machine Co., Ticonderoga, N. Y.

DRYER FELTS
Appleton Woolen Co., Appleton, Wis.
Fitchburg Duck Mills, Fitchburg, Mass.
F. C. Huyck & Sons.
Shuler and Benninghofen, Hamilton, Ohio.

DYNAMOS
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

The Sandy Hill Iron & Brass Works

Hudson Falls
New York

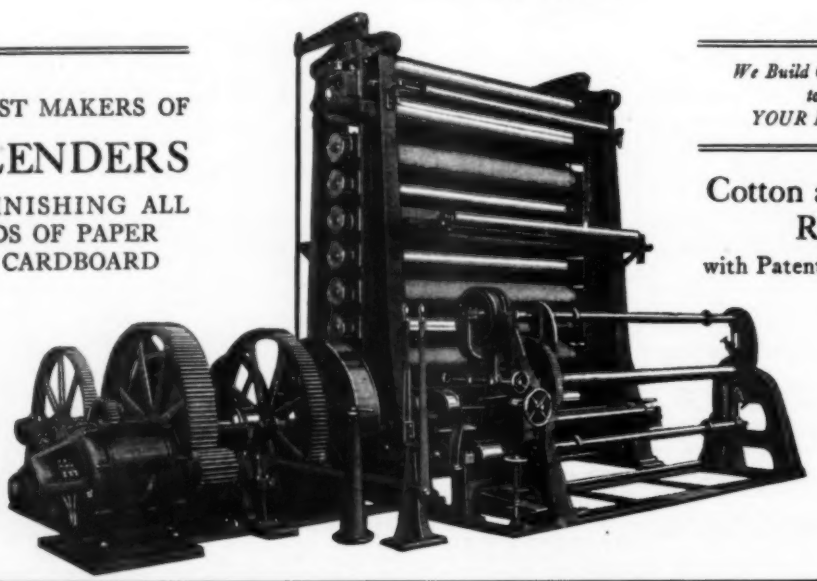
Manufacturers of **Paper and Pulp Mill Machinery**

Holyoke Machine Co. HOLYOKE MASS.

MAKERS OF

Improved Machinery for Wood Pulp, Paper Mills, Paper Converters, Printers and Lithographers

LARGEST MAKERS OF
CALENDERS
FOR FINISHING ALL KINDS OF PAPER *and* CARDBOARD



We Build Our Machinery to Meet YOUR Requirements

Cotton and Paper Rolls
with Patented Fastenings

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

DYESTUFFS
Binney & Smith, 81-83 Fulton St., N. Y. City.
E. I. Du Pont de Nemours & Co., Wilmington, Del.
Geigy Co., Inc., 89 Barclay St., New York City.
National Aniline & Chem. Co., 21 Burling Slip, New York City.
The Newport Chemical Works, Inc., Passaic, N. J.
The White Tar Aniline Corp., 56 Vesey St., New York City.

DUST COLLECTING SYSTEMS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

ELECTRIC HOISTS
John F. Byers Machine Co., Ravenna, Ohio.
Link-Belt Co., Chicago, Ill.
Northern Engineering Co., Detroit, Mich.

ELECTRIC MACHINERY
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.

ELEVATORS
The Jeffrey Mfg. Co., Columbus, O.
Weller Mfg. Co., 1820 N. Kostner Ave., Chicago.

ELEVATORS (Portable)
The Jeffrey Mfg. Co., Columbus, O.

ELEVATOR PUMPS
Earle Gear & Machine Co., Philadelphia, Pa.

ENGINES
The Brownell Co., Dayton, O.
Chandler and Taylor, Indianapolis, Ind.
Erie Ball Engine Co., Pittsburgh, Pa.
Kansas City Machine Works, Kansas City, Mo.

ENGINEERS
B. M. Baxter, 5716 Euclid Ave., Cleveland, O.
James L. Carey, 208 North Laramie St., Chicago, Ill.
George F. Hardy, 309 Brodway, New York City.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
Management Engineering and Development Co., Dayton, O.
H. B. Prather, Kirby Bldg., Cleveland, O.
Stebbins Engineering & Mfg. Co., Watertown, N. Y.

EVAPORATORS:
Charles Ordway, 25 Church St., N. Y. City.
Swenson Evaporator Co., Chicago, Ill.
Zaremba Co., Buffalo, N. Y.

EXHAUSTERS
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

FANS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

FELTS AND JACKETS
Appleton Woolen Co., Appleton, Wis.
Fitchburg Duck Mills, Fitchburg, Mass.
F. C. Huyck & Sons, Albany, N. Y.
Lockport Felt Co., Newfane, N. Y.
Paper Trading Co., Boston, Mass.
Shuler and Benninghofen, Hamilton, Ohio.

FELT ROLLS
Rodney Hunt Machine Co., Orange, Mass.

FELT AND WIRE GUIDES
Huband and Nash, Menasha, Wis.
Moore & White Co., Philadelphia, Pa.

FIBROUS PEARL FILLER
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

FILTER (Continuous Suction)
Glamorgan Pipe & Foundry Co., Lynchburg, Va.
Oliver Continuous Filter Co., Los Angeles, Calif.

FILTERS (Pressure and Gravity)
Hungerford & Terry, Inc., Philadelphia, Pa.
The Permutit Co., 440 Fourth Ave., N. Y. C.

FIRE ALARM SYSTEMS
The Autocall Co., Shelby, Ohio.

FIRE BRICK (Plastic)
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

FIRE PUMPS
Earle Gear & Machine Co., Philadelphia, Pa.

FLOORING
Jennison-Wright Co., Toledo, Ohio.

FLUID METERS
Bailey Meter Co., 2023 E. 46th St., Cleveland, Ohio.

FOURDRINIER WIRES
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
Lindsay Wire Weaving Co., Cleveland, Ohio.
The W. S. Tyler Co., Cleveland, Ohio.
Wisconsin Wire Works, Appleton, Wis.

FRICTION CLUTCHES
The Hill Clutch Co., Cleveland, Ohio.
Moore and White Co., Philadelphia, Pa
Weller Mfg. Co., 1820 N. Kostner Ave., Chicago.

FURNACE ARCHES
McLeod & Henry Co., Troy, N. Y.

GEARS
The Hill Clutch Co., Cleveland, Ohio.
Earle Gear & Machine Co., Philadelphia, Pa.
Foote Bros. Gear & Machine Co., 250 N. Curtis St., Chicago, Ill.
Wm. Ganschow Co., Chicago.

GLUES
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

GRATE BARS
Cyclone Grate Bar Co., Buffalo, N. Y.
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

GRINDERS
The Bagley & Sewall Co., Watertown, N. Y.
Glens Falls Machine Works, Glens Falls, N. Y.
Holyoke Machine Co., Holyoke, Mass.
Union Iron Works, Bangor, Me.
Valley Iron Works, Appleton, Wis.

GYPSUM ROOFING
Lathrop-Hoge Const. Co., Union Central Bldg., Cincinnati, O.

HOISTING AND CONVEYING SYSTEMS
John F. Byers Machine Co., Ravenna, Ohio.
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Northern Engineering Co., Detroit, Mich.
Robins Conveying Belt Co., New York City.
Weller Mfg. Co., 1820 N. Kostner Ave., Chicago.

HYDRAULIC TURBINES
Dominion Engineering Works, Ltd., Montreal, Quebec.
Holyoke Machine Co., Holyoke, Mass.
James Leffel and Co., Springfield, Ohio.
S. Morgan Smith Co., York, Pa.

INDUSTRIAL
The Nashville Industrial Corp., Jacksonville, Tenn.

INSTRUMENTS (Fluid Meter)
Bailey Meter Co., 2023 E. 46th St., Cleveland, Ohio.

IRON CASTINGS
Beloit Iron Works, Beloit, Wis.
Valley Iron Works Co., Appleton, Wis.

JORDAN FILLINGS
J. W. Bolton & Sons, Inc., Lawrence, Mass.

KNIVES
John W. Bolton & Sons, Inc., Lawrence, Mass.

LAYBOYS
Moore and White Co., Philadelphia, Pa.

KNIFE GRINDING MACHINERY
Machinery Co. of America, Big Rapids, Mich.

LIGHTING EQUIPMENT
Benjamin Elec. Co., Chicago, Ill.

LINE SHAFT BEARINGS
The Hill Clutch Co., Cleveland, Ohio.

MACHINE DRYER TEMP. CONTROL
Open Coil Heater and Purifier Co., Indianapolis, Ind.

MAGNETIC PULLEYS
Dings Magnetic Separator Co., 666 Smith St., Milwaukee, Wis.

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

MECHANICAL PULP
J. Andersen & Co., 21 E. 40th St., New York City.

MECHANICAL STOKERS
Sanford Riley Stoker Co., Worcester, Mass.

METAL PROTECTIVE PAINT
Detroit Graphite Co., 503 12th St., Detroit, Mich.

METERS (Fluid)
Bailey Meter Co., 2023 E. 46th St., Cleveland, Ohio.

MILL ARCHITECTS
Stebbins Engineering & Mfg. Co., Watertown, N. Y.

MIXING SYSTEM
Trimbey & Allen, Glens Falls, N. Y.

MILL WHITE
Detroit Graphite Co., 503 12th St., Detroit, Mich.
Tropical Paint & Oil Co., Cleveland, Ohio.
Vortex Mfg. Co., Cleveland, Ohio.

MOTORS
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

PAINTS
Detroit Graphite Co., Detroit, Mich.
The Franklin Paint Co., Cleveland, O.
The Tropical Paint & Oil Co., Cleveland, O.
Vortex Mfg. Co., Cleveland, Ohio.

PAINT GUN
Vortex Mfg. Co., Cleveland, Ohio.

PAPER BOARDS
The C. L. La Boiteaux Co., 200 Fifth Ave., N. Y.
Dana T. McIver, 116 N. Michigan Ave., Chicago.

PAPER CUTTERS & SLITTERS
Beloit Iron Works, Beloit, Wis.
Hamblet Machine Co., Lawrence, Mass.

PAPER DISTRIBUTORS
Bermingham and Prosser, Chicago, Ill.
H. G. Craig & Co., New York City.
Berton C. Hill Co., New York City.
Frank Levy, 483 Broadway, N. Y. C.
Dana T. McIver, 116 N. Michigan Ave., Chicago.
Maurice O'Meara, New York City.
Sabin Robbins Paper Co., Middletown, O.
Seaman Paper Co., Chicago, Ill.

PAPER EXPORTERS AND IMPORTERS
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.
Storm & Bull, 114 Liberty St., New York City.

PAPER MACHINES
The Bagley & Sewall Co., Watertown, N. Y.
Beloit Iron Works, Beloit, Wis.
The Black-Clawson Co., Hamilton, O.
Dominion Engineering Works, Ltd., Montreal, Quebec.

PAPER MANUFACTURERS
Bardeen Paper Co., Otsego, Mich.
Eastern Manufacturing Co., 501 Fifth Ave., N. Y. City.
Hammermill Paper Co., Erie, Pa.
Lincoln Paper Mills, Elkhart, Ind.
Marathon Paper Co., Rothschild, Wis.
Munising Paper Co., Munising, Mich.
Northern Paper Mills, Green Bay, Wis.
Oxford Paper Co., 200 Fifth Ave., N. Y. City.
Wausau Sulphate Fibre Co., Mosinee, Wis.
Wolverine Paper Co., Otsego, Mich.

PAPER MANUFACTURERS' SUPPLIES
J. Andersen & Co., 21 East 40th St., New York City.
Craig-Becker Co., 52 Vanderbilt Ave., N. Y. City.
Dallas Waste Mills, 130 Pearl St., New York City.
Detroit Chemical Works, Detroit, Mich.
Diamond Alkali Co., Pittsburgh, Pa.
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Invincible Paper & Pulp Corporation, 135 Broadway, N. Y. City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
Leahner Paper Stock Co., Hamilton, Ohio.
Mendelson Bros. Paper Stock Co., 910 Michigan Ave., Chicago.
Paper Makers' Chemical Co., St. Austell, England.
Paper Trading Co., Boston, Mass.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
A. Salomon, Inc., New York City.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

PAPER MILL BROKERS
Gibbs-Brower Co., 261 Broadway, N. Y. C.

PAPER STOCK CUTTERS
Taylor, Stiles & Co., Riegelsville, N. J.

PAPER AND PULP MILL MACHINERY
Beloit Iron Works, Beloit, Wis.
The Black-Clawson Co., Hamilton, O.
The Sandy Hill Iron & Brass Works, Hudson Falls, N. Y.

PARCHMENT MANUFACTURERS
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.

PERFORATED METALS
Harrington & King Perforating Co., 615 No. Union Ave., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Charles Mundt & Sons, 57 Fairmount Ave., Jersey City, N. J.
Weller Mfg. Co., 1820 N. Kostner Ave., Chicago.

PIPE BENDING
American Pipe Bending Co., Boston, Mass.

FOURDRINIER WIRES

Dandy Rolls *Cylinder Molds*

Brass, Copper and Iron Cloth

Bank and Office Railings

WIRE SIGNS

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Real Merit Placed

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They are ready to serve you

The Lindsay Wire Weaving Company

Collinwood Sta., Cleveland, Ohio

"Ask any Papermaker"

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

PIPING EQUIPMENT
M. J. Dougherty Co., 25th and Washington Ave., Philadelphia, Pa.
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.

PIPING SYSTEMS INSTALLED
M. J. Dougherty Co., 25th and Washington Ave., Philadelphia, Pa.
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.

PIPE THREADING & CUTTING MACHINERY
Toledo Pipe Threading Machine Co., Toledo, O.

PLUG MACHINES
Carthage Machine Co., Carthage, N. Y.

PNEUMATIC CHIP HANDLING SYSTEMS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

POWER TRANSMISSION
Link-Belt Co., Chicago, Ill.
The Hill Clutch Co., Cleveland, Ohio.
Rodney Hunt Machine Co., 45 Mill St., Orange, Mass.
Valley Iron Works, Williamsport, Pa.
Weller Mfg. Co., 1820 N. Kostner Ave., Chicago.

PRESS ROLLS
Rodney Hunt Machine Co., Orange, Mass.

PULP (Chemical)
J. Andersen & Co., 21 East 40th St., New York City.
Craig-Becker Co., 52 Vanderbilt Ave., N. Y. City.
M. Gottesman & Co., 18 E. 41st St., New York City.
Daniel M. Hicks, 200 Fifth Ave., New York City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
Price & Pierce, Ltd., 30 East 42nd St., New York City.
The Pulp & Paper Trading Co., 21 East 40th St., New York City.
Scandinavian-American Trading Co., 50 East 42d St., New York City.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.

PULP AND PAPER MACHINERY
Beloit Iron Works, Beloit, Wis.
Carthage Machine Co., Carthage, N. Y.
Frank H. Davis Co., Cambridge, Mass.
Glens Falls Machine Co., Glens Falls, N. Y.
Moore & White Co., Philadelphia, Pa.
Noble & Woods Machine Co., Hoosick Falls, N. Y.
Union Iron Works, Bangor, Me.
Valley Iron Works, Appleton, Wis.

PULP GRINDERS
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Works, Glens Falls, N. Y.
Union Iron Works, Bangor, Me.

PULP MILL BROKERS
Gibbs-Brower Co., 261 Broadway, N. Y. C.

PULP LAP SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.

PULP SHREDDERS
Carthage Machine Co., Carthage, N. Y.

PULP STONES
The Cleveland Stone Co., 1836 Euclid Ave., Cleveland, O.
The Smallwood-Low Stone Co., Lisbon, Ohio.

PUMPS (Stock)
Beloit Iron Works, Beloit, Wis.
Buffalo Steam Pump Co., Buffalo, N. Y.
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Co., Glens Falls, N. Y.

PUMPS (Centrifugal)
American Steam Pump Co., Battle Creek, Mich.
Earle Gear & Machine Co., Philadelphia, Pa.

PUMPS (Deep Well)
Gregg Pump Co., Kansas City, Mo.
Weber Subterranean Pump Co., 50 E. 42nd St., New York City.

PUMPS (Vacuum)
American Steam Pump Co., Battle Creek, Mich.
Dean Bros., Indianapolis, Ind.

RAG AND PAPER DUSTERS
Holyoke Machine Co., Holyoke, Mass.

ROOFS (Gypsum)
Lathrop-Hoge Const. Co., Union Central Bldg., Cincinnati, O.

ROTARY VACUUM PUMPS
Sandusky Foundry & Machine Co., Sandusky, O

RUBBER ROLLS
The American Wringer Co., Woonsocket, R. I.

SAVE-ALLS
Glens Falls Machine Co., Glens Falls, N. Y.

SAWS
Simonds Manufacturing Co., Fitchburg, Mass.
Earle Gear & Machine Co., Philadelphia, Pa.

SECOND HAND MACHINERY
Technical Products Co., 501 Fifth Ave., N. Y. C.

SCREENS
The Bagley & Sewall Co., Watertown, N. Y.
Shartle Bros. Mach. Co., Middletown, O.
Union Iron Works, Bangor, Me.

SCREENS (Perforated Metal)
Hendrick Mfg. Co., Carbondale, Pa.
Charles Mundt & Sons, 57 Fairmount Ave., Jersey City, N. J.

SCREEN PLATES
Central Mfg. Co., Kalamazoo, Mich.
William A. Hardy & Sons, Fitchburg, Mass.
Union Screen Plate Co., Fitchburg, Mass.

SHOWER PIPES
Sandusky Foundry and Machine Co., Sandusky, Ohio.

SIGNALING SYSTEMS
The Autocall Company, Shelby, Ohio.

SILENT CHAIN DRIVES
The Link Belt Co., Chicago, Ill.

SIZING SYSTEMS
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Process Engineers, New York City.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

SLITTING AND REWINDING MACHINERY
Beloit Iron Works, Beloit, Wis.
Cameron Machine Co., Poplar St., Brooklyn, N. Y.
Hamblet Machine Co., Lawrence, Mass.
Samuel M. Langston Co., Camden, N. J.
Meisel Press Mfg. Co., 948 Dorchester, Ave., Boston 25, Mass.

SOOT BLOWERS
Diamond Power Specialty Co., Detroit, Mich.
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

SODA ASH
Diamond Alkali Co., Pittsburgh, Pa.

SPEED CHANGES
Moore and White Co., Philadelphia, Pa.

SPEED REDUCERS
Foote Bros. Gear & Machine Co., 250 N. Curtis St., Chicago, Ill.
Wm. Ganchow Co., Chicago, Ill.
Weller Mfg. Co., 1820 N. Kostner Ave., Chicago.

SPRAY NOZZLES
Buffalo Forge Co., Buffalo, N. Y.

STEAM TRAPS
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

STOCK CIRCULATING SYSTEM
Claflin Engineering Co., Lancaster, Ohio.
Ticonderoga Machine Works, Ticonderoga, N.Y.

STOCK METER
Trimbey & Allen, Glens Falls, N. Y.

STOCK PUMPS
The Bagley & Sewall Co., Watertown, N. Y.
Beloit Iron Works, Beloit, Wis.
Buffalo Steam Pump Co., Buffalo, N. Y.

SUCTION ROLLS
Sandusky Foundry and Machine Co., Sandusky, Ohio.

SULPHITE MACHINERY
Stebbins Engineering Co., Watertown, N. Y.

SULPHITE PULP
Riordan Sales Co., Montreal, Canada.

SULPHUR
Union Sulphur Co., 17 Battery Place, New York City.

SULPHUR BURNERS
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Works, Glens Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.

TIMBER & PULPWOOD
District Forester, Portland, O.
District Forester, Ketchikan, Alaska.

TRUCKS (Roll Handling)
The Elwell-Parker Elec. Co., Cleveland, Ohio.

TRUCKS (Industrial)
The Elwell-Parker Elec. Co., Cleveland, Ohio.

TURBINES (Hydraulic)
Rodney Hunt Machine Co., Orange, Mass.
James Leffel and Co., Springfield, Ohio.
S. Morgan Smith Co., York, Pa.

VACUUM PUMPS
Nash Eng. Co., South Norwalk, Conn.

VACUUM SYSTEMS
Open Coil Heater and Purifier Co., Indianapolis, Ind.

VALVES
Carthage Machine Co., Carthage, N. Y.
The Crane Co., Chicago, Ill.
G. M. Davis Regulator Co., 414 Milwaukee Ave., Chicago, Ill.
The Wm. Powell Co., Cincinnati, Ohio.

VALVES (Digester)
Neenah Brass Works, Neenah, Wis.

VAPOR ABSORPTION SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
J. O. Ross Engineering Corp., 30 E. 42nd St., New York City.

VARIABLE SPEED ENGINES
The Brownell Co., Dayton, Ohio.
Chandler and Taylor, Indianapolis, Ind.
Erie Ball Engine Co., Pittsburgh, Pa.

VENTILATING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
J. O. Ross Engineering Corp., 30 E. 42nd St., New York City.

WASHER WIRES
The W. S. Tyler Co., Cleveland, Ohio.

WASTE PAPER STOCK
Mendelson Bros. Paper Stock Co., 910 S. Michigan Blvd., Chicago, Ill.

WATCHMAN'S CLOCKS
Chicago Watchman's Clock Works, 1526 Wabash Ave., Chicago.
Hardinge Bros., Inc., 1771 Berteau Ave., Chicago, Ill.

WATER FILTER
Glens Falls Machine Co, Glens Falls, N. Y.
Hungerford & Terry, Inc., Philadelphia, Pa.

WATER POWER EQUIPMENT
Rodney Hunt Mach. Co., 45 Mill St., Orange, Mass.

WATERPROOF LINING
The National Waterproofing Co., Philadelphia, Pa.

WATER-SOFTENING AND PURIFYING SYSTEMS
The Permutit Co., 440 Fourth Ave., N. Y. C.
Wm. B. Scaife and Sons Co., Oakmont, Pa.

WATER WHEELS
Rodney Hunt Machine Co., Orange, Mass.
James Leffel and Co., Springfield, Ohio.
Holyoke Machine Co., Holyoke, Mass.
S. Morgan Smith Co., York, Pa.

WET MACHINES
The Bagley & Sewall Co., Watertown, N. Y.
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Works, Glens Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.

WOOD BLOCKS
Jennison-Wright Co., Toledo, Ohio.

WOOD CHIP SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.

WOOD PIPE
The Michigan Pipe Co., Dept. 17, Bay City, Mich.
A. Wyckoff & Son Co., Elmira, N. Y.

WOOD ROLLS
Rodney Hunt Mach. Co., 45 Mill St., Orange, Mass.

WOOD SPLITTERS
Carthage Machine Co., Carthage, N. Y.

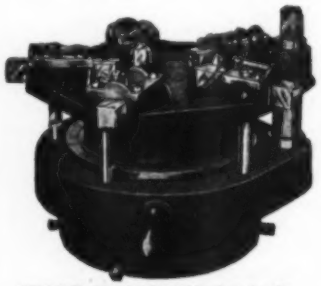
WOOD WASHERS
Carthage Machine Co., Carthage, N. Y.

WIRE SIGNS
Cheney Bigelow Wire Works, Springfield, Mass.

Fast, accurate pipe-fitting with "Toledo" Pipe Tools

THE "Toledo" line of Threaders, Cutters and Power Drives represents pipe-fitting equipment which cannot be equalled for accurate work, fast performance and general utility. They are ideal for quick emergency work and equally capable of handling the biggest, most complicated pipe fitting jobs. Send for catalog and Power Drive bulletin.

"Toledo" adjustable geared threader No. 2, capacity 2½ to 4-inch pipe inclusive. A light, portable device that threads fast and accurately. Other adjustable hand threading devices for pipe from ⅛ up to 12 inches.



"Toledo" geared adjustable threader No. 25, capacity 2½ to 6-inch pipe inclusive. The patented construction of this threader eliminates weaknesses generally found in devices where camplate principle is used for die adjustment to various sizes.

"Toledo" Power Drive for operating "Toledo" Geared Pipe Tools

Cut to left shows "Toledo" Drive operating "Toledo" Cutter No. 250. Capacity of cutter is 2½ to 6-inch pipe inclusive. Cuts clean and straight, leaving no burr. Power Drive is interchangeable and will drive ALL "Toledo" geared tools; it is simply constructed, portable and will operate any tool FIVE times faster than hand operation with ratchet handle or driving cross.

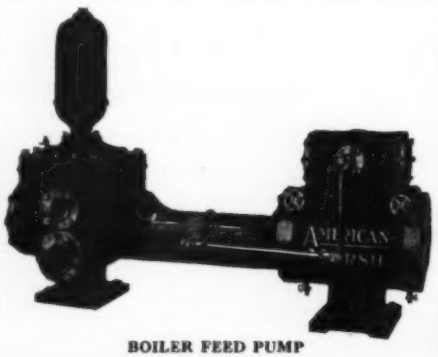
THE TOLEDO PIPE THREADING MACHINE CO. **TOLEDO, OHIO**

NEW YORK OFFICE: 50 CHURCH STREET, NEW YORK CITY

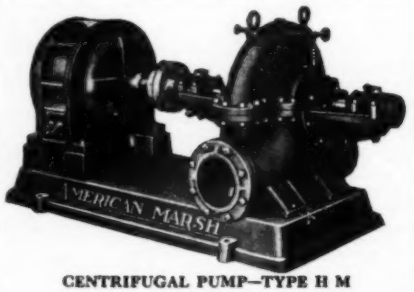
AMERICAN-MARSH PUMPS

Simple Reliable Efficient

Especially adapted for paper mill service where absolute reliability is essential. The American-Marsh Pump has no internal stuffing boxes, no tappets and no slide valves. The auxiliary valve is of the semi-rotative disc type of an improved design. The main steam valve is of the balanced piston type. Water ends are fully bronze fitted including heavy cast bronze removable bushings.



BOILER FEED PUMP



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The line also includes POWER PUMPS, AIR COMPRESSORS, VACUUM PUMPS, CONDENSERS, DEEP WELL ENGINES, STOCK PUMPS

American Steam Pump Co., Battle Creek, Mich.

Chicago Office, 1220 Monadnock Block **New York Office, 17 Battery Place**

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Sandy Hill Iron & Brass Works.....1922
Sanford-Riley Stoker Co.....1895
Scaife & Sons, Wm. B.....1920
Scandinavian American Trading Co....1906
Seaman Paper Co.....1819
Shartle Continuous Beater Co., The....1882
Shaw & Co., L. S.....1912
Shuler & Benninghofen.....1900
Signode System.....1900
Smith Co., S. Morgan.....1888
Smallwood-Low Stone Co.....1862
Stebbins Engineering Co.....1886
Storm & Bull.....1912
Swenson Evaporator Co.....1876

Taylor, Styles & Co.....1918
Technical Products Co.....1920, 1921
Ticonderoga Machine Works.....1896
Toledo Pipe Thread. Mach. Co.....1926
Trimbey & Allen.....1882
Tropical Paint & Oil Co., The.....1826
Tyler Company, The W. S.....1889

Union Iron Works.....1812
Union Screen Plate Co.....1896
Union Sulphur Co.....1907
U. S. Cast Iron Pipe & Fdy. Co.....——
U. S. Dept. of Agriculture.....1901

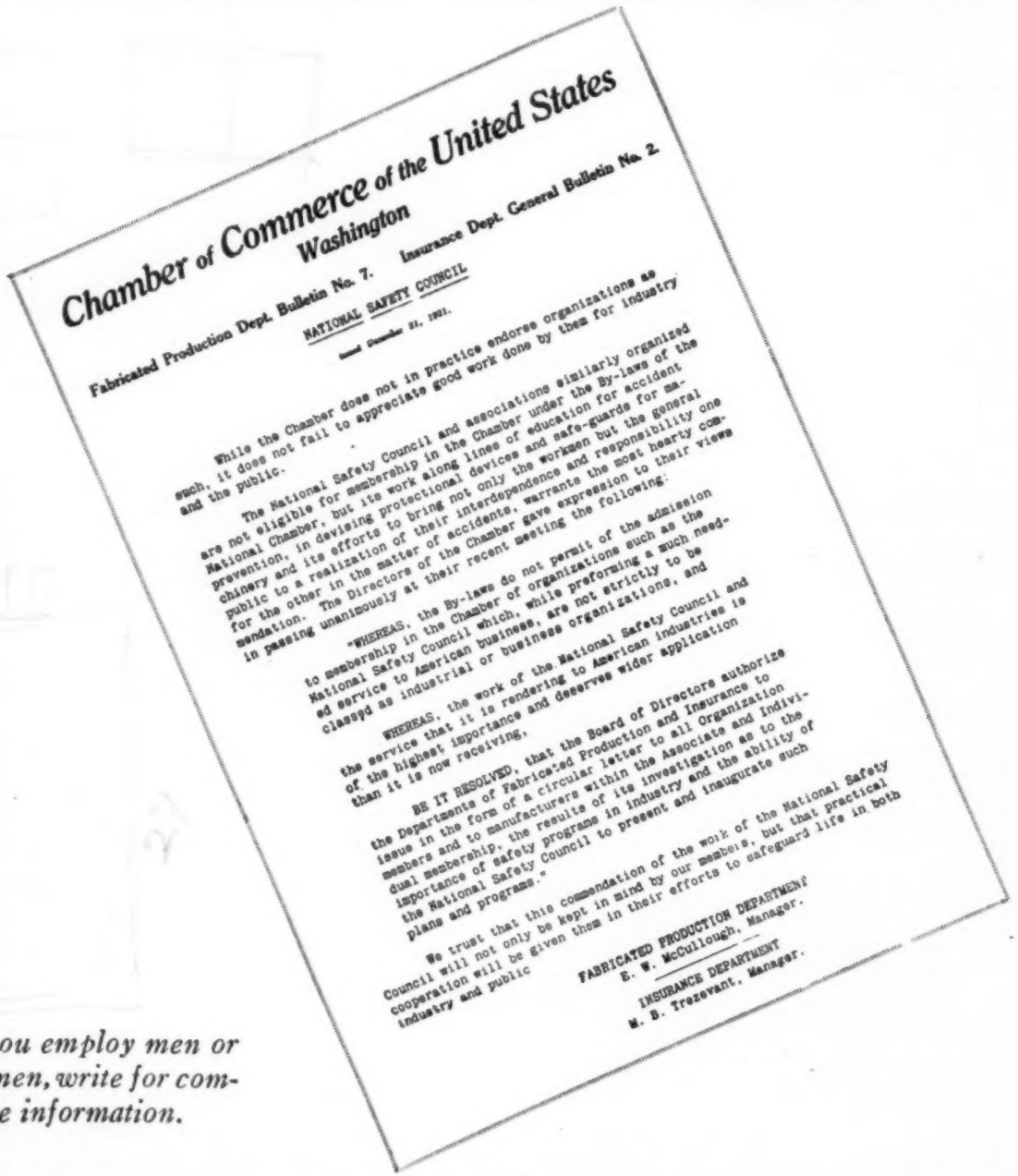
Valley Iron Works Co.....Back Cover
Vortex Mfg. Co., The.....1810

Wausau Sulphate Fibre Co.....1880
Weber Subterranean Pump Co..Front Cover
Weller Mfg. Co.....1868
Western Paper Makers' Chem. Co.....1868
White Co., The.....——
White Tar Aniline Corp., The.....1876
Wing & Evans.....1908
Wisconsin Wire Works.....1892
Wolverine Paper Co.....1902
Wyckoff & Son Co., A.....1914

Yale & Towne Mfg. Co.....1896

Zaremba Co.....1789

THE NATIONAL SAFETY COUNCIL is a co-operative, non-commercial association, consisting of more than 4,000 member companies—representing 6,000,000 workmen. Through its aid, member plants have been enabled to reduce accidents fifty to eighty per cent.



Chamber of Commerce of the United States
Washington

Fabricated Production Dept. Bulletin No. 7. Insurance Dept. General Bulletin No. 2.

NATIONAL SAFETY COUNCIL

Issued October 21, 1921.

While the Chamber does not in practice endorse organizations as such, it does not fail to appreciate good work done by them for industry and the public.

The National Safety Council and associations similarly organized are not eligible for membership in the Chamber under the By-laws of the National Chamber, but its work along lines of education for accident prevention, in devising protectional devices and safe-guards for machinery and its efforts to bring not only the workmen but the general public to a realization of their interdependence and responsibility one for the other in the matter of accidents, warrants the most hearty commendation. The Directors of the Chamber gave expression to their views in passing unanimously at their recent meeting the following:

"WHEREAS, the By-laws do not permit of the admission to membership in the Chamber of organizations such as the National Safety Council which, while preforming a much needed service to American business, are not strictly to be classed as industrial or business organizations, and

WHEREAS, the work of the National Safety Council and the service that it is rendering to American industries is of the highest importance and deserves wider application than it is now receiving,

BE IT RESOLVED, that the Board of Directors authorize the Departments of Fabricated Production and Insurance to issue in the form of a circular letter to all Organization members and to manufacturers within the Associate and Individual membership, the results of its investigation as to the importance of safety programs in industry and the ability of the National Safety Council to present and inaugurate such plans and programs."

We trust that this commendation of the work of the National Safety Council will not only be kept in mind by our members, but that practical cooperation will be given them in their efforts to safeguard life in both industry and public

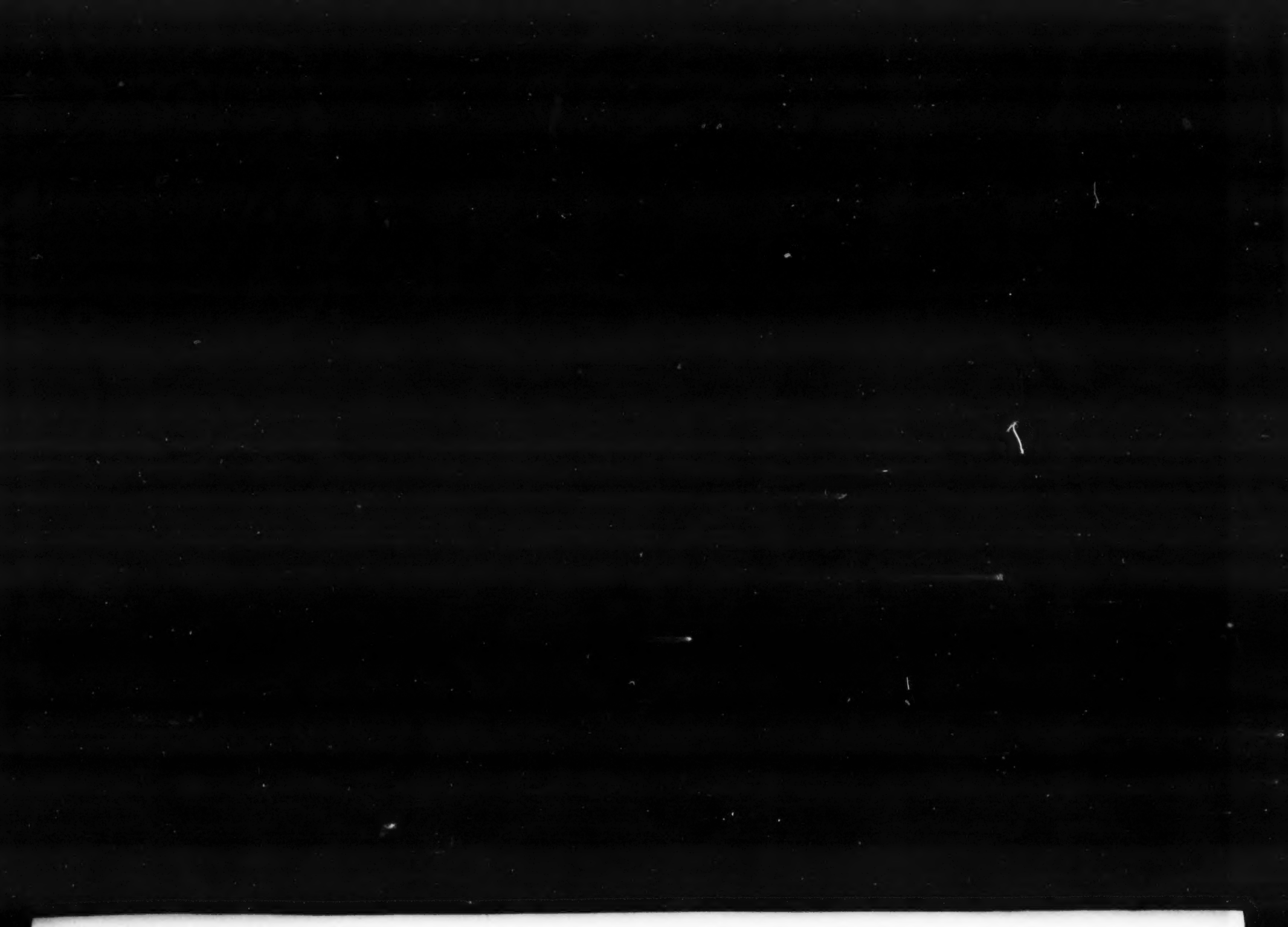
FABRICATED PRODUCTION DEPARTMENT
E. W. McCullough, Manager.

INSURANCE DEPARTMENT
H. D. Trezevant, Manager.

If you employ men or women, write for complete information.

NATIONAL SAFETY COUNCIL

CO-OPERATIVE 168 North Michigan Avenue, CHICAGO NON-COMMERCIAL



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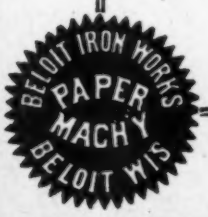

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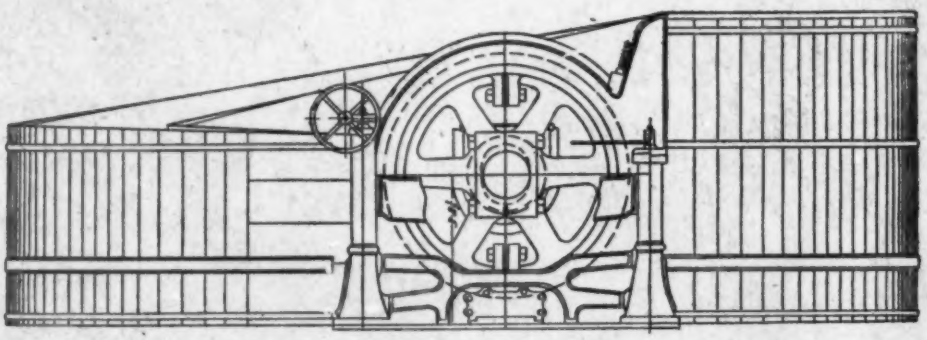

The Valley Iron Works Company

APPLETON, WIS.